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THE TELEPHONE CENTRAL OFFICE SYSTEM OF PARIS.

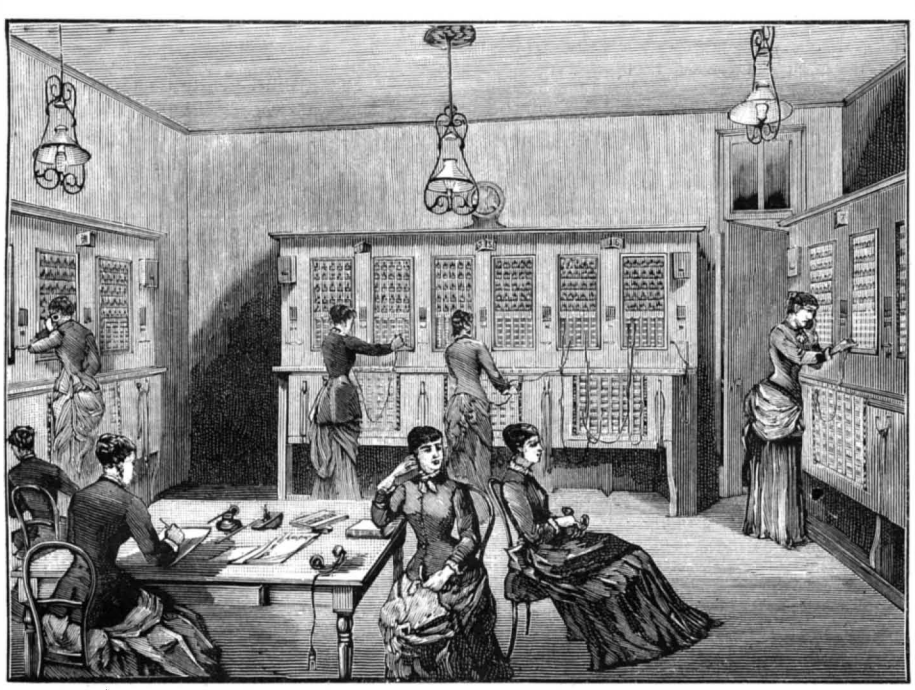
Paris has ten telephone central offices and three thousand subscribers. The general plan of working the central offices does not differ materially from that of some of our American exchanges, but the arrangement of the line wires is very different from ours, and in many respects better. In the central offices the frames carrying the switches and annunciators are arranged along the walls on three sides of the room, sufficient space being left behind them for manipulating the wires for inspection, etc.

The annunciators and switches are arranged in groups of twenty-five, the annunciators being above and the switches below. Between every two sets of annunciators is placed a triangular block, which is colored and numbered. The call bells, which are common to all subscribers of the same series, are placed at the extremities of the frames, and between the sets of annunciators there are switches for connecting the employes with the subscribers.

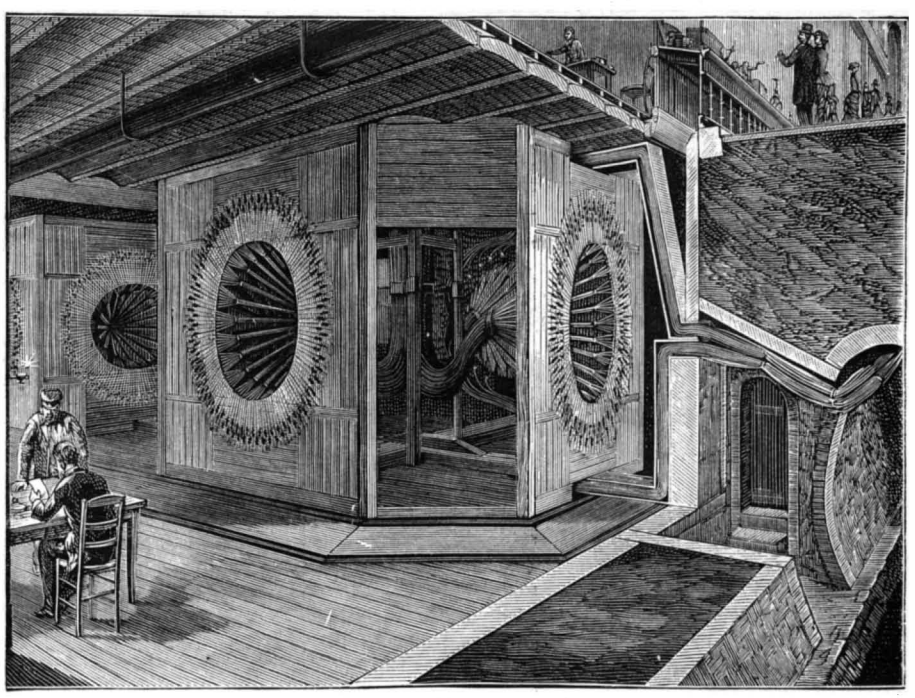
The service is performed during the day by sixteen young ladies, and at night by a less number of men. A directress has charge of the staff of operators, and an inspector has general supervision of the affairs of the office.

Important offices are provided with an instructor, whose office is to teach telephony to beginners, a special hall being provided for this use. Order and regularity rules, and mistakes and delays are generally the fault of subscribers and not of the operators.

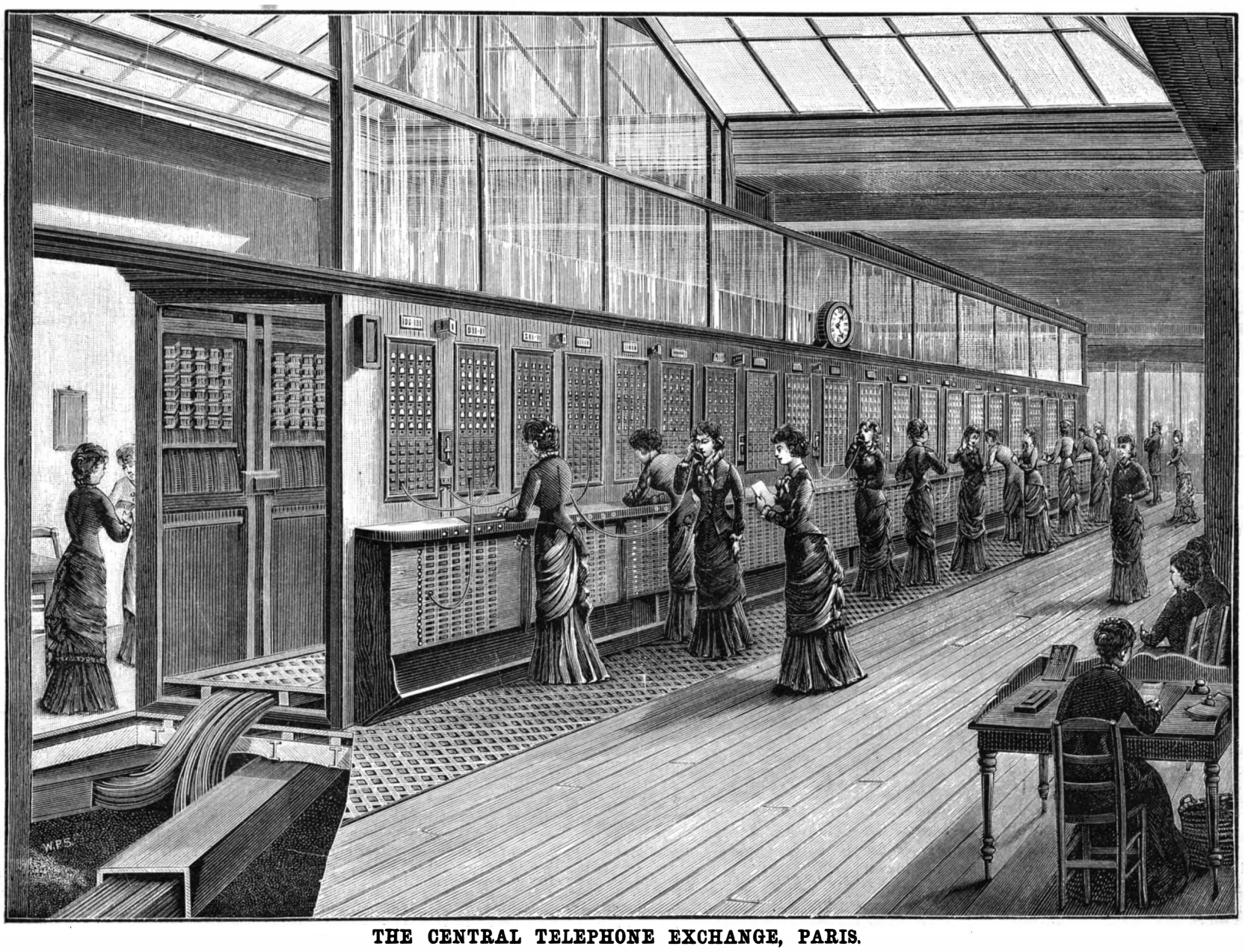
The triangular colored and numbered blocks above referred to are for convenience in connecting one central office with another, so that the subscribers of different offices may con-



SWITCH BOARDS.



WIRE CELLAR.



THE CENTRAL TELEPHONE EXCHANGE, PARIS.

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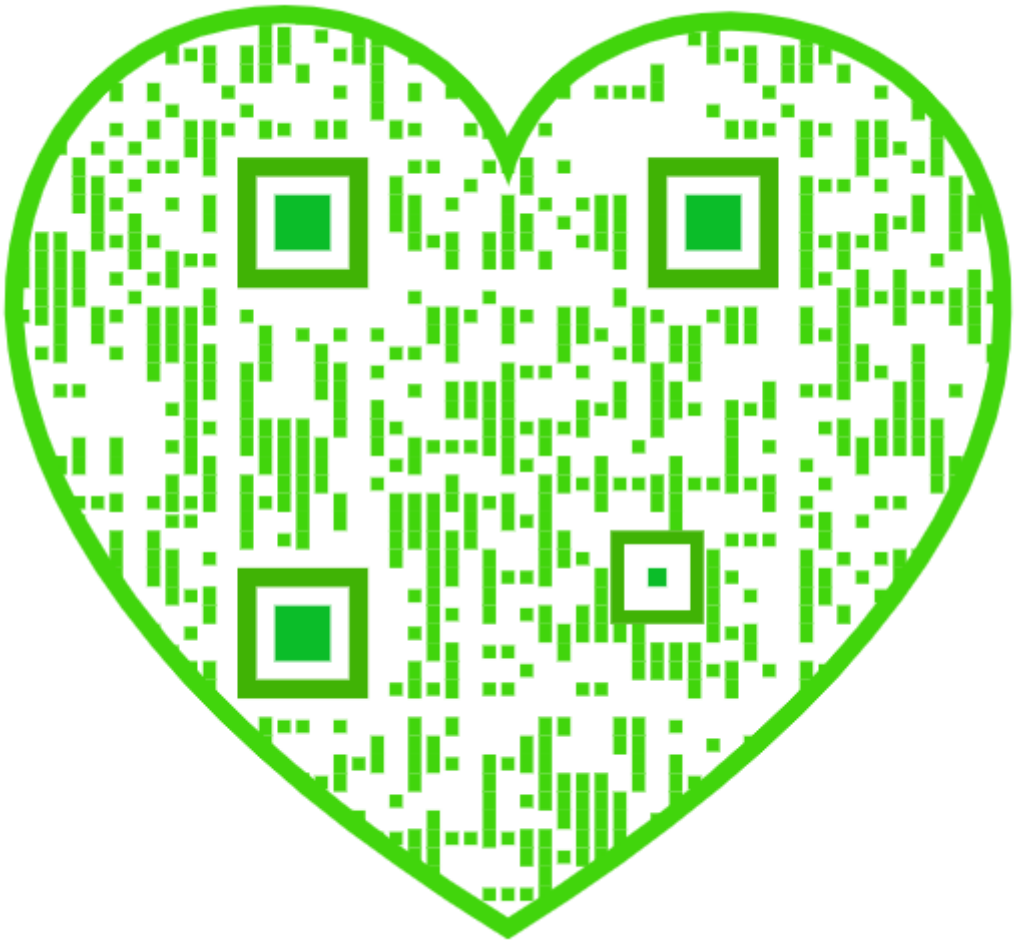

verse as conveniently as if both were directly connected with one office.

The subscribers' wires are united into cables of fourteen wires each. They are affixed to the vault of the sewer and are consequently out of sight and out of the way. The cables are laid by the administration of telegraph lines, to whom, as well as to the city of Paris, the company pays a tax of so much per meter. The employes of the company have no right to enter the sewer, and when anything gets out of order it is the duty of a particular branch of the administration of the telegraph to repair it.

The telephone company extends the double telephone wires from the subscriber's instrument through a hole in the sewer, and connection with the proper wires and cable is made by the agents of the administration of the telegraph.

The ends of the wires of the cables are distributed over the switch boards in the wire cellar of the central office, and upon one of these switch boards the double wire of the subscriber terminates and is readily found. The wire is then connected with wires leading to the annunciator and switch board of the central office, where the subscriber is assigned a number.

The telephone used in Paris is Adir's. Three cells of Leclanché battery are employed, one for the transmitter and two for calling. Every three months the transmitters are changed, and although they might be able to work longer, this plan is adopted to insure good service. The telephone of each subscriber is tested daily as another precaution.

The Pittsburg Exposition.

The seventh annual exhibition of the Pittsburg Exposition Society will be held in the city of Allegheny, opening September 6, and closing October 13, 1883. The main building is 600 feet long by 150 feet wide, with galleries 45 feet wide, extending around the entire building. The floral hall is 130 by 90 feet with an annex 130 by 30 feet. The machinery hall is 170 by 150 feet, and the permanent steam power is sufficient to run the shafting, furnishing power free to all. The general reception of articles will begin August 25. The society propose as one of the attractions this year to create a "relic department," devoting a large room exclusively to the exhibition of old relics, pictures, and objects of interest of every character, large and small, particularly those connected or associated with the early history of Pittsburg or Western Pennsylvania, and to this end respectfully request the loan of any relic of this character.

A Fatal Earthquake.

The recent accounts of the destruction in the island of Ischia, opposite Naples, revives the old time records of the ravages of the earthquake in Portugal and other countries. A sudden shock of earthquake was felt at a little after nine o'clock, July 28, in Casamicciola, Ischia, at which hour a large portion of the people were at the theater. The building was shaken down, and many of the people killed or injured. Nearly all the houses in the town collapsed, and the killed and wounded number not less than 2,000.

The ground opened in many places, while in other places there was no movement. Water gushed out of springs. Several boilers in the bathing house burst. The theater, which is a wooden structure, was literally torn open, allowing the audience to escape.

The Brush Secondary Battery.

The patent interference case of the American Electric Storage Company of New York against Charles F. Brush of the Brush Electric Company of Cleveland, Ohio, was decided Aug. 2 by giving Brush priority of invention. The declaration in the case contained three counts, each supposed to represent a distinct invention claimed by both parties, as follows: First, a secondary battery having a plate of cast lead supporting the active coating; second, a secondary battery element consisting primarily of cast lead; third, a method or process of making a secondary battery element consisting in casting a suitable body, frame, or other support of lead, and placing thereon an active or absorbing coating or substance.

Two Disagreements Ended.

A strike by about 900 cloakmakers in New York city was ended August 2, after an idleness of two weeks. The terms of the agreement finally made were a guarantee of $15 per week to each salaried employe on the basis of eleven hours per day.

On the same day the lockout of 10,000 cigarmakers was ended by mutual concessions by the strikers and the manufacturers' union, the actual terms not having been made public. This lockout lasted sixteen days.

A FRUITFUL source of damage done to boilers, and one which has ruined thousands, is the practice of blowing a boiler off and immediately refilling it with cold water, while the brickwork is red hot. The *Age of Steel* believes that nothing will tear a boiler to pieces quicker than this. Boilers have exploded with disastrous effect from this cause after the fire had been drawn. Probably most persons not familiar with the matter would be surprised to know the pertinacity with which cold water will cling to the lowest point of a boiler under these circumstances. Local contraction of such severity is thus induced that nothing can withstand its effects, and a few repetitions are generally sufficient to ruin any boiler.

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NEW YORK, SATURDAY, AUGUST 11, 1883.

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THE REVIVAL OF CHERRY.

Those to whom fifty years is a memory readily recall the cherry wood tables, bureaus, drawer chests, that were then in fashion, when the more gaudy and more costly mahogany had but lately come in. It is an evidence of a return to good taste that the wood of the cherry tree is again in favor, not only as it exists in old furniture, but in its new requirements. It is largely used in cases for musical instruments—melodeons and organs—and in furniture—chairs and tables—after being "ebonized," or blackened by acids and dyes. But it is also coming again into use in its natural color. One of the finest banking houses in the Eastern States is finished entirely in cherry, and it is beautiful. The wood, filled and not varnished, has a soft glow not possessed by any other, and has none of those distortions of grain that are so unpleasant in mahogany.

The timber is chosen from the wild cherry, which in New England and the North generally does not usually grow to a girth of more than twenty inches, but in some of the Western States and in the South frequently attains a diameter of twenty-four inches. The domestic fruit cherry gives some good specimens of small timber, but as the tree is rarely sacrified until it is past bearing and is decayed, this source of supply is precarious. Like all close grained timber, the best specimens are those which grow singly in exposed situations and not in a dense forest. The facility with which cherry can be worked makes it a favorite with the cabinet maker.

EFFECT OF ALCOHOL UPON DIGESTION.

It cannot be claimed that we have yet learned all that is to be known about our stomachs and the reactions that take place within them, notwithstanding the fact that one man, at least, lived for many years with an *open window*, as it were, in his stomach.

Every contribution to our knowledge of the subject based on real, first hand, experimental proof, has some value, hence we think that the recent experiments of Dr. P. J. Spenzer upon the effect of wine on the medical properties of pepsine are worthy of careful and thoughtful attention, imperfect as they are.

Pepsin, also known as chimosin, is one of the active ferments of digestion. For medicinal purposes it is prepared by scraping the well washed stomach of a hog, and in this state possesses the property of dissolving a large quantity of coagulated albumen, such as the white of egg. Dr. Spenzer, in his paper read before the Ohio State Pharmaceutical Association, gives the amount of white of egg (hard boiled) that will be dissolved by one grain of the pure pepsine, of different makers, when mixed with eight drops of pure concentrated hydrochloric acid in six hours. The amounts varied from 68 to 170 grains, with an average of about 80 grains.

He found that the acid alone would dissolve half as much as the acid and pepsin, or 40 grains, and that eight drops of acid and 100 c. c. of ten per cent alcohol would dissolve as much albumen as the ordinary commercial pepsine and acid would together. This would make alcohol equal to pepsine as a digestive agent for egg albumen. For raw beef the case is quite different; acid and alcohol having less power than acid alone, while acid and milk sugar dissolved as much meat as the best pepsine with acid.

It is to be regretted that alcohol was not tried in combination with pepsine.

In conclusion, Dr. Spenzer states his conviction that an hour's exercise in the fresh air is equal in digestive power to any usual dose of pepsine, regardless of maker. When commercial pepsine is used it should be as fresh as possible.

H. Seeman has proved (*Centralblatt fur Med. Wissensch.*), that free hydrochloric exists in the stomach, although the presence of peptones prevents its detection by means of methyl violet. This is probably one reason why it has so long been an unsettled question whether it was hydrochloric or lactic acid that gave the acidity to the gastric juice.

AERIAL NAVIGATION.

A certificate of incorporation has been filed in the office of the Secretary of State of Illinois for the "Aerial Navigation Company of Chicago," the object of the incorporators being "the transportation of passengers and freight through the air." It is asserted that the machines to be manufactured by this company are a perfection of the one tested at Hartford, Conn., several years ago, which at the time attracted considerable interest. Probably this refers to several trials of a balloon made by Mr. E. F. Ritchel, of Bridgeport, Conn., who exhibited in Hartford, in June, 1878, a balloon with propelling apparatus attached by which the upward and downward movements of the balloon could be governed, and by which in calm weather its course could be directed.

The balloon was a horizontal cylinder of silk, twelve feet long and twenty-four inches diameter, capable of containing about 3,0 0 feet of gas. Suspended to it by cords and steel rods was a flat frame of brass pipe, pointed at each end, and having a seat for the operator. In front of the seat was a gear wheel with two cranks, connected by a vertical shaft and a horizontal shaft to two propeller wheels, one at the lower end of the vertical shaft under the frame, and the other in front of the operator, and this wheel was attached to the shaft by a universal joint so that it could be turned a distance of about thirty degrees from the shaft in a horizontal plane by the feet of the aeronaut. This wheel was the propelling power and also the steering device. The levitat-

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ing power of the balloon was barely sufficient to raise the apparatus and its load, the vertical propeller assisting if a rapid rise was desired, and bringing the balloon down without emitting any of the gas.

At one trial, on a calm day, the balloon rose from the baseball grounds at Colt's Meadows, Hartford, passed over Colt's factory, and nearly over the Connecticut River, turned about and returned, descending to the ground at the place from which it started, the distance being probably half a mile and return, the balloon's height after rising from the earth varying from 300 to 400 feet, or thereabout.

At another trial, on the succeeding day, with quite a stiff breeze blowing, the aeronaut was unable to turn his balloon around, or to stem the wind, and was forced a distance of nearly nine miles, when he descended and came back, with his balloon, by carriage. But on this occasion he dedescended once on his trip to the dooryard of a farmer, procured a glass of water from the well, and rose again, hoping to make a return trip.

No accurate test was ever made of the propelling or lifting power of the two fans, but they were sufficient, as proved by repeated experiments, to raise, lower, and steer the balloon except in a strong wind, the operator rotating the cranks at the rate of 100 revolutions per minute, producing, by means of pinions, a revolution of the fans of 3,500 turns per minute.

CHOLERA.

The article quoted from the *Lancet*, July 28, says: "We know that it (cholera) is propagated solely through excreta; obviously, if the excreta of a cholera patient are allowed to dry in contact with the air, the air will then become infected. . . . It is wanton recklessness to let excreta pass into the sewers. . . . Whatsoever disinfectant we employ, we should use at once."

The writer of the above was certainly not aware that our sanitary plumbing laws do not allow the excreta to pass into the sewer without going through a long soil pipe in the house, where, before it enters the sewer, it encounters a current of fresh air which there is made to enter the pipe, and traveling in the opposite direction through the whole length of the pipe to the top of the house after having, according to its nature, as is above stated to be well known, taken the infection from the excreta, and then passes out through the open end at the top of the house.

On a calm day, when the atmosphere is called heavy, the air from thousands of excreta pipes doubtless does sometimes make its presence known to the dwellers and walkers below, whose supply of air comes from above, but perhaps it was considered that the noxious quality of the infection would be lessened by the greatness of the number of people who would share it between them.

On such days in London, when the foggy air enters the city at one end, there you may see a long distance; but as it slowly travels along its miles of streets, it gains gradually in density by the smoke from the tops of the houses growing darker and darker, until before it has reached the other end the continuously added contributions have made it dark as night.

If infection add to the specific gravity of air, would it not act in New York as coal smoke does in London?

A plausible plan would be to make it impossible for sewer gas to enter houses or otherwise do harm by causing draught from the houses to the sewer, and from the sewers through purifying fires and pipes heated by them, up high chimneys built for that purpose or those of manufacturers, who might be compensated for their use.

There may be some objection to that plan, but fifty years ago the largest hotel in Boston used it very successfully; a tall chimney in their courtyard, into which a draught was caused by a fire flue running into it, being made available.

S.

CHINA AS A MARKET.

AN article in the London *Journal of the Society of Arts* for July gives some interesting statements in regard to China as a market for the manufactured goods of the Western countries. He says that the great and increasing demand for cotton goods has suggested to prominent Chinese the establishment of cotton mills to manufacture not only imported cotton, but that of native growth. The scheme has not, however, advanced much beyond the embryo stage. The writer says that there is a great demand in China for needles, matches, window glass, and kerosene oil. The oiled paper and semi transparent shell that has heretofore been the substitute for glass in windows is gradually disappearing in localities near the trading ports.

As an instance of the increasing demand for glass, the following figures are worth noting. At the newly opened port of Wu-hu, on the Yang-tse-Kiang, the importations increased from 9,000 square feet in 1877 to 47,000 square feet in 1880. Again, at Wenchow, the importations for the same period increased from 7,400 square feet to 28,200 square feet.

The trade in friction matches is a large one and is increasing. At Hankow the importation increased from 42,980 gross in 1877 to 324,317 gross in 1880, while at Tientsin the figures were nearly doubled in one year, rising from 92,000 gross in 1880 to 181,540 in 1881.

Needles for hand sewing are largely imported, the English needles being deemed greatly superior to those made in China.

Brass buttons, fancy soaps, furniture, cutlery, clocks, toys, photographs, canned fruits, sweetmeats, and crackers and biscuit are all welcomed in China, and command good prices. Old iron is a commodity greatly in demand. Bale hoops from baled packages, barrel hoops, plates of boiler iron, wheel tires, old horse shoes, pieces of wire, and similar waste are in demand for small manufactures of iron and for strengthening manufactures of wood. The Chinese workmen prefer these scraps of iron to the mercantile sizes and shapes.

But the article of foreign commerce which threatens to distance all other competitors in point of popularity is kerosene oil. The development of the trade in this article has been remarkable of late. It is entirely supplanting the native bean and tea oil, which has done duty hitherto for lighting purposes, and may be truly described as supplying a want long felt. The oil is at present almost entirely supplied from the factories at Philadelphia, and the trade is practically a monopoly. From the high popularity it enjoys, there is every reason to suppose that, until the petroleum wells, which are known to exist in China, are opened up, the importation of the foreign article will continue to increase for many years to come. The extent of this increase may be gathered from the following returns: At Hankow, the imports rose from 27,976 gallons in 1877 to 285,157 gallons in 1880; at Wu-hu, from 2,190 gallons to 71,110 gallons during the same period; while the returns for Shanghai show that, in 1879, the importation reached the prodigious total of 4,780,440 gallons.

Stewed Fruit for the Gouty and the Dyspeptic.*

Probably the impression first created by scanning the title of this paper will be as follows: "Why, what have either the gouty or the dyspeptic to do with stewed fruit at all?" That sugar is apt to disagree with sundry stomachs, causing great acidity, is a clinical fact not to be disputed. But because such is the case with a limited number of persons it does not seem, to me at least, that therefore a sweeping prohibitory law is to be laid down for a large section of the community. Gout poison, all admit, is a product derived from the albuminous constituents of our food, as nitrogen is a marked element in its composition. It is, then, the albuminous element in our food which has to be avoided in lithiasas. How sugar, fruits, and even vegetables came to be banned, my researches have not enabled me to ascertain.

From the time of Magendie's path-breaking essay, writers on gout have advised the restriction of the nitrogenized, or azotized, constituents of our food in cases of lithiasis. But that the objection to sugar in gouty cases exists may not be denied. In speaking of stewed fruit for the gouty and the dyspeptic my views will be heterodox in the eyes of many. But neither the light of chemistry nor the lessons of practice conflict with my views. I am quite prepared to undergo any criticism these views may elicit or provoke. Indeed, the subject would be all the better for being thoroughly ventilated.

At the outset, I admit that for many persons—gouty, dyspeptic, and glycosuric—ordinary stewed fruit is objectionable from the amount of added sugar it contains. Where the acidity of fruit is masked or hidden by an excess of sugar, then the resultant product is cloying to many palates, and offensive to many stomachs. Probably in this all readers will agree with me. But it is by no means necessary to render stewed fruit objectionable by adding much sugar to it. Deprived of this excess of added sugar, stewed fruit can not only be rendered unobjectionable, but be converted into an actual prophylactic measure, especially in cases of lithiasis. In order to attain this end all that need be done is to neutralize the excessive acidity by an alkali, and then little or no sugar is required. Thrifty housewives have long been familiar with the fact that the addition of a small quantity of the bicarbonate of soda to stewed fruit reduced the acidity, so as to save the necessity for much sugar. This was done simply for economy. The principle has a far wider application. Last June I was requested to visit a lunatic in the Midlands who was also gouty; and when the gout was acutely present she was more excitable and violent than usual. No medicine would she take, but she was very fond of stewed fruit. To add potash to her stewed fruit was very easy, yet very effectual. After this I gave my cook instructions to perform a series of experiments for me with all our ordinary native fruits. The result of this was that the amount of bicarbonate of potash required for each pound of fruit was found to be about as much as would lie upon a shilling. And this is a much better guide for a cook than to put so many grains.

With all fairly ripe fruit this was just sufficient to neutralize the acidity, and bring out the natural sweetness; indeed, the resultant product was quite sweet enough for most adult palates. Such stewed fruit could be eaten alone, or with milk puddings, or with cream, or the Swiss milk in bottles. Gooseberries, currants of all kinds, apples, and plums, all alike were excellent when so prepared. There are some points, however, to be attended to in practice, which are of more or less importance. The first matter is this: with dark fruits, as the black plum, for instance, the color is impaired by the alkali, and the fruit is less attractive to the eye than is that of the ordinary stewed fruit, which is of a deep, clear crimson.

This matter is easily got over: a little cochineal will give the desired color. Another is this: Where there is no natural sweetness, to neutralize the acid completely by an alkali leaves nothing, simply a cold mass, to which the palate is absolutely indifferent. Such is the case with rhubarb. Here it is well to use half or all the amount of alkali with some sugar. The same is the case with early gooseberries before they have any natural sweetness; no sugar formed in them. Here the full quantity of alkali should be used, and the remaining acidity met by sugar. Where three quarters of a pound of sugar is required to sweeten one pound of fruit, only one-quarter of a pound of sugar is necessary after the alkali has been added. The sour-sweet taste is thus secured, which is toothsome.

Now, in these two instances the stewed fruit is only rendered less objectionable to the stomach plagued with acidity, not made quite inoffensive. But for ordinary gouty individuals not troubled with acidity of the stomach, such stewed fruit is quite admissible, and forms a pleasant method of taking potash. The whole subject is one which deserves attention from invalids as well as their medical attendants, as it opens up to many a new field of diet altogether. Fruits *au naturel*—as the strawberry, for instance—are good in gout from the salts they contain, and are unobjectionable stewed, if it were not for the acetous fermentation of the added sugar. Here soda may be used. But where there is lithiasis the alkali ought to be potash. The gouty and the bilious alike are troubled with the products of the metamorphosis of albuminoids.

Neither the lithates of the gouty nor the bile acids of the bilious are derived from the saccharine or farinaceous elements of the food. It was possible to make bricks without straw, but it is impossible to make bricks without clay! No liver can make these nitrogenized substances from simple hydrocarbons: it is physically impossible! The dietary for each is the same—a non-nitrogenized dietary, in which vegetables and farinaceous matters are indicated, and saccharine matters, too, unless acidity in the stomach is produced by tem. Milk puddings and stewed fruit are excellent for the dyspeptic, the bilious, and the gouty, as my experience tells me; and for one of those who suffers from taking sugar nineteen would be all the better for stewed fruit. But for those who dislike sweets, and for those who suffer from acidity, it is well to prepare the stewed fruit with alkalies, completely and solely or partially, as the case may be. This may sound very heterodox to some readers, but just let the incredulous test the matter for themselves.

Now, there are two other matters remaining to be alluded to, on which it is impossible to speak dogmatically or *ex cathedra;* they are, rather, matters of personal belief, and they are these: 1. It does not seem a matter of indifference in lithiasis what forms of albuminoids are taken. The flesh of animals is rather converted into peptones by pepsin in an acid medium—that is, by gastric digestion—than by trypsin in an alkaline medium. And such peptones seem specially liable to form lithates. Caseine is more specially digested by trypsin in the intestine, and such caseine peptones seem less readily converted into lithates; the clinical fact being that a milk dietary or a pulse dietary is good for the subjects of lithiasis. Caseine is the form of albuminoid, it seems to me, best suited to the gouty. Milk or milk puddings (made without eggs) are capital food for the cholæmic or the lithæmic. These fibrin-albuminoids, digested by pepsin, are laxative, while caseine is binding or constipating.

Milk puddings, then, go well with stewed fruit, which is a laxative. Many thoughtful physicians agree with me in the above matter. Now I am approaching what some may hold very disputable ground, yet nevertheless I venture to say here what I am beginning to think. Both for the classical diabetic and the glycosuric, cane sugar—the sugar of commerce—is bad, producing the unpleasant symptoms of sugar in the blood very readily. Yet many glycosuric individuals can take farinaceous matter with comparative immunity from discomfort. Starch in its way to grape sugar is much less troublesome than is cane sugar passing into grape sugar; why I do not know, but the fact remains. Now, with many glycosuric individuals fruit stewed in the manner advocated here is quite permissible, while ordinary stewed fruit is very objectionable.

For the dyspeptic, the gouty, the bilious, and the glycosuric individual (as well as the truly rheumatic, a small class), fruit stewed with an alkali in the proportion of as much bicarbonate of soda as will lie upon a shilling to the pound of fruit when put in the oven, will be found both palatable and permissible. It saves the gastric acidity from the acetous fermentation of the sugar in the dyspeptic, or with the glycosuric relieves him from the excess of cane sugar which disagrees with him. Where there is distinct gout, not only is fruit stewed with an alkali good and unobjectionable, but if it be prepared with the bicarbonate of potash it is converted into a therapeutic agent of no mean value; while the resultant product is quite sweet enough for a palate which has outlived the "sweet tooth" period. The whole matter is a simple one, yet it seems to contain much promise for many persons.

* By J. Milner Fothergill, M.D., physician to the City of London Hospital for Diseases of the Chest. Communicated to the *Lancet*.

Progress of the Westinghouse Brake.

The reliability and excellence of this brake has become so well established by use on passenger cars that it is now being extensively applied to freight cars. We are informed that the Westinghouse Campany now has orders to fit up sixty thousand freight cars with the brake.

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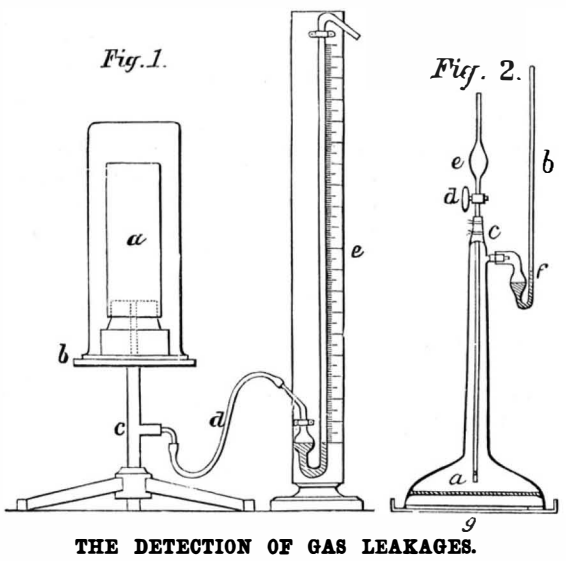
THE DETECTION OF GAS LEAKAGES.

The accompanying illustrations show the principles of construction of two instruments designed by Herr C. Von Thau, for estimating and discovering gaseous mixtures in air. The first is called a diffusiometer (Fig. 1), and shows the proportion of illuminating gas existing at any time as a mixture with air. A porous earthenware cylinder, *a*, is closed with an India-rubber stopper. By means of a perforation of the stopper, which rests upon the table, *b*, the pipe, *c*, is put in communication with the interior of the tube. This pipe is closed at the bottom, but is connected at one side by the India-rubber pipe, *d*, with a gauge, *e*. The leg of the gauge is filled with litmus water. The vertical part of the gauge is eight millimeters in diameter, and is divided in millimeters, with the zero point at the water level. The



THE DETECTION OF GAS LEAKAGES.

calibration of the instrument is thus effected: A five liter gas-holder is to be half filled with air, and 100 cubic centimeters of common gas introduced therein. A plate of glass is then slipped under the bell when it is nearly drawn out of the water, and the contents lifted and shaken together. This process quickly and thoroughly mixes the air and gas, and the compound may then be applied to the porous cylinder by inverting the gas-holder over it. Immediately the action of diffusion causes the water in the gauge to rise, and in the course of from five to ten seconds it reaches the maximum, which is marked. This is the 2 per cent line, and similar proceedings with 250 and 500 cubic centimeters of gas in the same mixing vessel give the 5 per cent and 10 per cent data. The diffusive action through the porous cylinder is so quick that in half a minute after the gaseous mixture has been removed the water in the gauge falls to its normal level. The purpose of this arrangement is to give warning of the presence of an explosive mixture of gas and air in closed apartments.

The second figure represents the other apparatus designed by Herr Von Thau, and is called a diffusioscope, which is intended to facilitate the discovery of leaks in gas mains or pipes. A glass tube is fixed in a very much flattened funnel, which is closed at *a* by a porous but otherwise airtight diaphragm. A capillary gauge, *b*, is connected by means of a cock inserted in the side of the funnel as shown. The upper end of the funnel-shaped stand is fitted with a tube, *e*, provided with a cock, *d*, and connected at *c* with an India-rubber cap. In use the cock, *d*, is first opened for a short time, to establish equilibrium of pressures. This cock is then closed, the cover, *g* (usually kept on the bottom of the stand), removed, and the funnel is held over the suspected part of the gas main. Wherever there is a leak the gas collects under the porous plate, diffusion commences, and the gauge rises. To clear off the contained gas the gauge is taken off, and the cock, *d*, opened for a moment, when the instrument is ready for a new trial. When the delicacy of the apparatus is increased by the use of a diffusion diaphragm of large area in conjunction with a very small gauge, it is possible by it to discover leaks too small to ignite. The paper above referred to is given, *in extenso*, in the *Journal für Gasbeleuchtung*.

Asphalt as Fuel.

Inventors ought to find a good field in the study of some effective means to utilize asphalt as fuel. The solution of this question would be of great service to this country. It is said that many of what were thought to be coal mines, recently discovered in various parts of Mexico, are really deposits of bitumen. Now while asphalt is highly combustible there seems to be at present no practicable method to utilize it as fuel, owing to its melting when subjected to heat. It is likely, however, that with the demand for cheap fuel now felt all over the country for railway, mining, and other industrial purposes, some effective method can be devised to make practical use of its heat producing qualities; burning it, perhaps, after reducing it either to a liquid or vaporized form. The inventor of such a process could command a handsome fortune for the use of the right in this country. The products of the new oil wells in Vera Cruz, much of which are said to be too heavy for illuminating purposes, might also be utilized in the same manner.—*Mexican Financier.*

London as a Commercial Entrepot.

The East and West India Docks Company of London has boldly embarked in a gigantic enterprise, for which some commercial prophets predict a failure. This is the construction of docks at Tilbury, on the Thames, opposite Gravesend, of such magnitude that the *Globe* says: "On the whole, this dock extension promises to be the most remarkable that even London has ever witnessed, and will leave all other ports in the world far behind." They will have a tidal basin with a depth of forty-three feet, and the largest vessels afloat will go in and out without regard to the tide. The contracts call for four dry docks, with a total length of 1,730 feet, a floating derrick with a lifting capacity of 100 tons, special wharves and abattoirs for the cattle traffic, 15,000 lineal feet of quay berths, from forty to fifty miles of permanent railroad tracks, and a large hotel for the accommodation of passengers. "Tilbury is certainly at a considerable distance from London," says the *Globe*, "but with the railway facilities to be organized, a few miles more or less will really be a matter of no great importance, while it is undeniable that, with the huge ships of the present day—and they still seem to be continually advancing in dimensions—the avoidance of a few miles of river navigation, with its windings and shallows and fogs, and the necessary cost of tonnage and pilotage, must be an immense advantage." The contracts call for the completion of the work within two years and a half, of which one year has already elapsed.

Novel Mode of Making Electric Lamps.

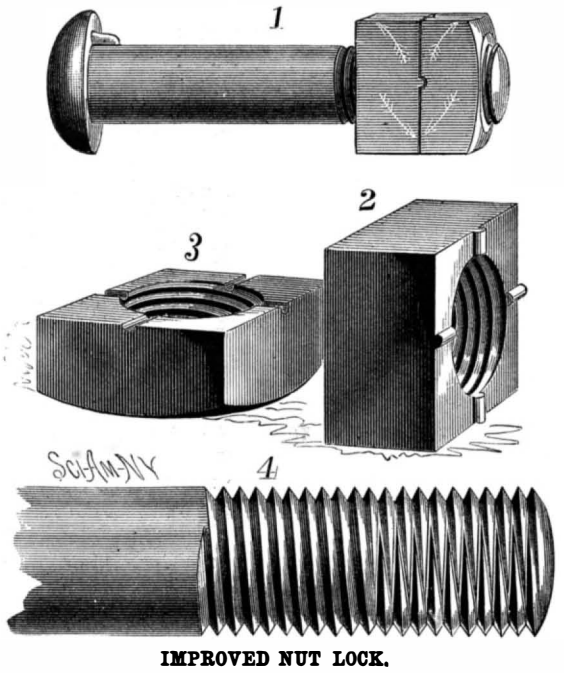
A new way of making incandescence lamps has been patented by Messrs. Soward, Probert, and Boulton. They take a glass bulb with two electrodes through it at a suitable distance apart, and either solid or tubular. A carbonaceous gas is then inserted into the bulb, and the electrodes connected to a generator of high tension. Sparks pass through the gas inside the globe between the electrodes and decompose the gas, so as to build up an arch or loop of carbon between the electrodes. This bridge is the filament, and after exhausting the globe of air the lamp is ready for use.

NEW NUT LOCK.

A right hand screw thread is first cut upon the bolt of any desired pitch. A left-hand screw thread is cut upon as much as is desired of the right-hand screw, and a right-hand or support nut is turned upon the right hand thread, and a left-hand or locking nut is turned upon the left-hand thread of the screw. When the right-hand nut is turned to its place and followed to a snug contact by the left-hand nut, any tendency of the right hand or support nut to unscrew will equally tend to tighten the left-hand or lock nut, so that the right-hand nut is positively and securely locked.

Projections are formed on the lock nut contact side of the support nut, and furrows or depressions are made in the contact side of the lock nut.

When the nuts are made in this form, the support nut must be turned past the point at which it is ultimately to rest to just half the length of the projections. The lock nut is then turned almost to contact with the projections of the support nut, and so that these projections correspond to their respective depressions, at which position, if the nuts



IMPROVED NUT LOCK.

have been properly constructed, their wrench surfaces will be in the same planes. Now, by turning both at once with the wrench, the support nut will turn down to its resting place, and the lock nut will turn up to a snug contact with the support nut, when, as in the former case, every tendency of the support nut to unscrew will only force the lock nut more snugly against it.

In the engraving Fig. 1 shows the nuts in place on the bolt, and Figs. 2 and 3 show the contact faces of the nuts.

This invention has been patented by Mr. B. S. Cocker. Further information may be obtained by addressing Messrs. Cocker & Hill, Topeka, Kan.

COMBINED TAG AND ENVELOPE.

We give an engraving of a novel device which permits of sending the bill or invoice with the goods in all classes of business, a matter which is often of great importance, especially when the goods are of a perishable nature, the object being to enable the dealer to know at once the cost of the merchandise, so that the goods can be sold without delay. The greatest advantage is the saving of stamp and envelope, as this combined tag and envelope does the whole thing for simply price of tag. Another advantage is that the address is concealed, and dealers cannot ascertain the address of the customers of their competitors, while at the same time railway and express companies can readily obtain the address when necessary.

The invention consists of an envelope made of tough paper—preferably waterproof—and provided with a long flap capable of covering one side of the envelope, and both envelope and flap are provided with an eyelet. The bill or invoice is inserted in the envelope, and a string, wire, or hook is passed through the eyelets, securely fastening the envelope. The tag may be tacked to a barrel, box, or other package, and the flap may be secured by means of a rubber

COMBINED TAG AND ENVELOPE.

or oilcloth strip, or other device. It is stated that there are over 150,000 now in use.

This useful invention has been patented by Mr. Jos. T. Dunham, and is manufactured by Jos. T. Dunham & Co., Pier 24, North River, New York city.

Improved Method of Producing Printing Surfaces from Gelatine Reliefs.

Messrs. Brown, Barnes and Bell, of England, have lately made an improvement on the Woodbury plan of producing printing surfaces. The method of working is to take a plate or sheet of lead and place above and beneath it flat sheets of steel; outside of the steel are placed sheets of cardboard, to give elastic pressure. On top of the cardboard another sheet of lead is placed, on it a lead plate, then a steel plate, and lastly a second sheet of cardboard. The sheets as thus arranged are passed between an adjustable spring metal roller press, set to a certain thickness. The sheets of lead are reduced to the thickness of the set of the press when passed through the same. This action produces a true, even, and proper surface for receiving the impression from the gelatine relief.

The gelatine relief is obtained in the well known manner of sensitizing with bichromate of potash.

To imprint the gelatine relief upon the sheet of lead prepared as described, the relief is placed upon the lead plate, then covered on both sides with a sheet of steel and cardboard, and all are passed through the spring roller press, which has the same set or adjustment as before; the addition of the gelatine relief causes an impression from the relief to be produced upon the lead sheet, which serves, when backed up, as the type for printing from.

When it is desired to print with greasy or fatty inks a grained surface is used, which is first obtained in the production of the original gelatine relief by placing between the positive and sensitive gelatine sheet a gauze or perforated sheet. A grained surface is thus incorporated into the original gelatine relief during the process of light printing. As thus prepared the relief is laid upon the lead sheet, and both are passed through the press as before stated. The grain of the gelatine relief is thus transferred to the lead sheet.

In place of producing the grained surface as above described, after the gelatine relief has been impressed upon the lead sheet, a sheet of fine wire gauze, muslin soaked in glue and dried, sand paper, or their like is laid upon the impressed lead sheet and backed with a soft cloth, and all are passed through the press between the steel plates and cardboards.

A roughened surface is thus imparted to the lead plate. The advantage claimed for the general method as described is, that the gelatine relief is more easily impressed upon thin sheets of lead than upon thick plates by hydraulic pressure. Large sheets can be easily prepared, and less expensive machinery is required.

VESUVIUS.—Letters from Naples say that the condition of the volcano has again become an object of serious attention to Professor Palmieri, and of wondering interest to ordinary spectators. Since the 21st June the activity of the crater has been steadily increasing, the first symptom being the upburst of a column of flame, visible at a great distance. Every night a fiery glow, like a gigantic crown, hovers over the summit, forming in the clear summer night a spectacle of mingled picturesqueness and terror.

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THE BRUSH ELECTRIC LIGHT WORKS, ROCHESTER, N. Y.

The following description of the power station for the Brush Electric Lighting Company, of Rochester, N. Y., is from the *Milling World*. These works are located on the west bank of Genesee River, at what are styled "the Lower Falls," within the city of Rochester, N. Y., and they derive their motive power from the waters of that river. They are intended for generating electricity for lighting purposes in the city of Rochester and vicinity. They consist of a brick superstructural building or house, 100 feet long by 50 feet wide, and one story high, resting upon and supported by substantial substructural walls and piers of stone and brick, of various heights and forms, and substantially based upon prepared foundations at various levels in the solid rock.

Fig. 1 is a cross sectional elevation through the wheel and gear pit, as viewed from the north or down stream end. Fig. 2 is a longitudinal section from the bottom of the wheel pit upward, as viewed from the west or land side of the works

The superstructure is spanned across its width at the base of the roof with nine trussed girders, which support the roof and the line shafting with its leading wooden rimmed band wheel, 5 foot diam eter by 4 foot 8 inch face, and 18 pairs of fast and loose wood-rimmed pulleys, 42 inch diameter by 13 inch face each, making 360 revolutions per minute, and connecting by 12 inch belts with 18 electro-dynamic machines arranged upon the floor near either side of the building, as shown in Fig. 1, giving them 756 revolutions per minute, at an expense of 40 horse power each, making a total of 720 horse power, supporting 720 lights, equal to 40 lights per machine, or one light per horse power. The magnitude of the lights is not stated. In Fig. 2 is a side elevation of one of the machines. The fast and loose pulleys which drive the dynamos were furnished by the Taper Sleeve Pulley Works of Erie, Pa., and they are so constructed and arranged that by one single and gradual movement of a double-headed oscillating cam, in connection with a belt shifter, the loose pulley, which hangs on a hollow independent bearing (not shown in the cut), concentric with and surrounding the shaft without contact therewith, is thrown into gear and set in motion, so that as the cam is continuously moved forward through the extent of its parallel arc, which holds the loose pulley in gear, the belt is shifted on to it, when, by a little further movement of the cam, its inclined part at the rear end disengages the clutch, and the loose pulley, together with the belt and the actuated machines, cease moving and remain idle, until the cam is moved in the reverse direction, setting the idler in motion, shifting the belt into working position, and setting the machine in motion, when by the inclined part of the opposite end of the cam from that afore-mentioned, the clutch is disengaged and the idler is again at rest, out of contact with any of the running parts.

It is in contemplation to add 9 more electric machines in this same building, to be driven by the same power, should time and circumstance demand it, making 27 in all, producing 1,080 lights and requiring 1,080 horse power. The power is to be obtained by the use of two Victor turbine water wheels, 20 inches in diameter, made by the Stillwell & Bierce Mfg. Co., Dayton, Ohio. This wheel is noted for the extraordinary power developed by it, in proportion to its diameter, while at the same time the percentage of power in proportion to water expended (according to tests made at the Holyoke testing flume) ranks it among the highest and best. Another advantage possessed by this wheel is that its comparatively small diameter for a given power causes it to revolve so rapidly as to make a considerable saving in the cost of shafting and gearing.

The situation and surroundings of the water wheels and their appurtenances in this case are indeed unique and extraordinary, and indicate a perspicacity of discernment, acuteness of conception, boldness of design, and thoroughness of execution on the part of the projector, that stamps him at once as eminently qualified to place and execute a work like this, environed as it is by great natural obstacles and serious practical difficulties. To make a proper place for the flume or forebay, an open recess or bay was cut into the upper rock bank about 32 feet horizontal depth by 20 feet wide and 46 feet perpendicular depth, down to a level with the bottom of the head race. The bottom of this bay is about 45 feet below the floor of the superstructure, and extends under it about 28 feet. From the bottom of this recess at its back side is a shaft about 12 feet square, sunk perpendicularly into the rock to a depth of about 90 feet, to a point some four or five feet below the surface of the backwater from the river below the falls, which are nearly 100 feet high, as will be seen by the cuts. From this shaft a culvert extending about 36 feet in height from the bottom of the shaft is cut through the rock out to the river, as shown in the cuts. Between the top of this opening or doorway, and the bottom of the race and forebay, is about 55 feet vertical thickness of rock, as shown in cuts, being represented in section in Fig. 1.

On the bottom of said recess in the rock, and partly over the shaft therein, is the flume, containing two U-shaped iron forebays, AA, seven feet high, opening toward the head race, and from the bottom of which are suspended two iron stand pipes, BB, 76 feet and 10 inches long by 42½ inches in diameter, their upper ends opening into the forebays to receive water to supply the wheels. At one side of each stand pipe, and connected thereto with a short cylindrical tube, is an iron wheel case, C, with a draught tube attached to its bottom, and extending some ten feet downward, and entering the back water. One wheel case in each figure is partly broken away, to show the wheels. Besides the support to the stand pipes by their connection with the iron forebays, A A, they and the wheel cases, C C, are supported at their bottoms by iron beams, as shown in cuts. The turbines are placed in the wheel cases, C, and each one has about 58 feet of steel shafting, 3⅛ inches in diameter, coupled to it and supported by bracket bearings projecting from the stand pipes, B B. Each of said shafts has on it, near its top end, a spur pinion 21¾ inches in diameter by 17 inch face, 17 teeth, 4 inch pitch, machine dressed. These gear into a core spur wheel 69⅛ inches in diameter, having 54 wooden cogs, and which is hung on near the bottom of a steel countershaft 6 inches in diameter and 60 feet long, on which, near its top end, is a bevel wheel 88 inches in diameter, 18 inch face, 55 teeth, 5 inch pitch, gearing into a core bevel wheel, 99·6 inches in diameter, with 56 wooden cogs, 18 inches wide.

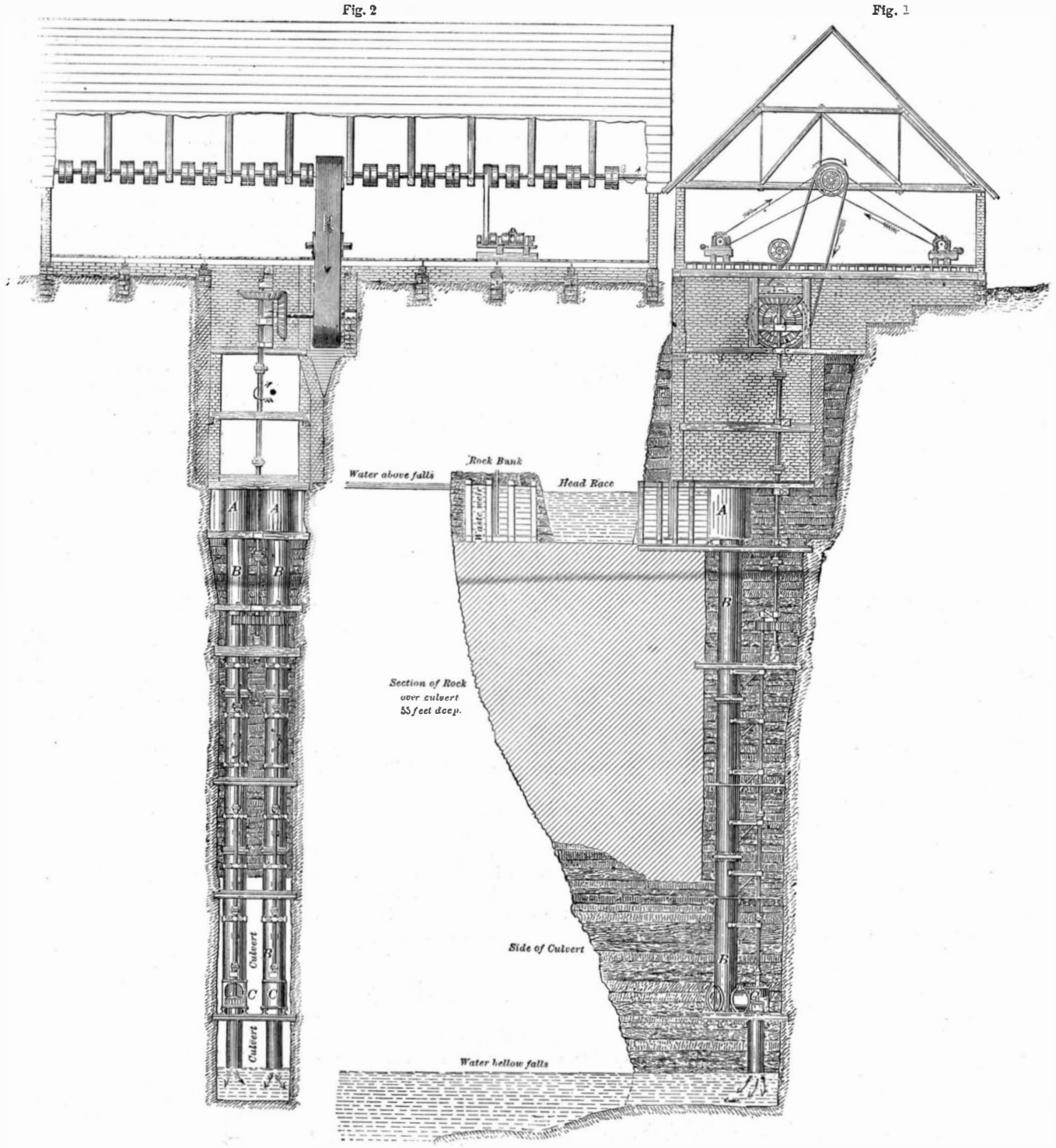
This wheel is on a short, horizontal shaft, 6 inches in diameter, having on its farther end, beneath the floor of the building, an iron spider carrying a wooden rim band wheel, 10 feet in diameter by 4 feet 8 inches face, carrying a rubber belt 4 feet 6 inches wide by three-eighths inch thick, which connects with the heretofore described five-foot leading band wheel on the main line of shafting above, and drives them.

The turbines operate under 94 feet head of water, including the ten-foot draught tubes, and are estimated to make 582 revolutions per minute, and develop 572 horse power each, which, combined, equals 1,144 horse power. The counter upright shaft makes 183·22 revolutions per minute, the counter horizontal shaft, with the ten foot band wheel, 179·95 revolutions per minute, the main line shaft about 359·9 revolutions per minute, and the electro dynamos 755·79 revolutions per minute.

This work has all been carried out under the direction and immediate supervision of Mr. Joseph Cowles, of Rochester.

Fig. 2

Fig. 1



ELEVATIONS OF THE BRUSH ELECTRIC LIGHTING WORKS, ROCHESTER, N. Y., SHOWING THE 500 H. P. TURBINES.

The Fatal Cramp.

A writer in the *British Medical Journal* calls attention to the frequent notices of death, by cramps, of bathers, and suggests some preventives—remedies are in these cases too late. He says that cramp is a painful and tonic muscular spasm. It may occur in any part of the body, but it is especially apt to occur in the lower extremities, and, in its milder forms, it is limited to a single muscle. Pain is severe, and the contracted muscles are hard and exquisitely tender. In a few minutes the spasm and pain cease, leaving a local sensation of fatigue and soreness. When cramp affects only one extremity, no swimmer or bather, endowed with average presence of mind, need drown; but when cramp seizes the whole of the voluntary muscular system, as it probably does in the worst cases, nothing, in the absence of prompt and efficient extraneous assistance, can save the individual from drowning. Its most powerful and most avoidable cause is the sudden immersion of the body, when its surface is highly heated, in water of a relatively low temperature.

How a Woodchuck Looks to a Child.

The Boston *Post* says, a gentleman from Boston was riding with his two little daughters in Maine the other day when a woodchuck scampered along the road in front of the horse. The youngest of the little girls, aged about 3½ years, watched the woodchuck with eager interest, and when he turned and disappeared in the woods, she said to her father, with the relieved air of having solved a mystery, "Papa, it was a sponge, wasn't it?"

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Development of the Artificial Ultramarine Industry.

The following abstract of a paper prepared by Dr. Ernst Rohrig for the *Chemiker Zeitung*, has been made especially for our columns as presenting facts of world wide interest. Although it is doubtful whether the animal consumption is steadily increasing, the German factories, according to Dr. Rohrig, show an increased production in the last ten years of about three million pounds. Aniline colors are fast crowding ultramarine to the wall for paper making, and the poor quality of some of the ultramarine that has been put on the market has also brought the whole into disrepute. Germany surpasses in number and size of its factories all other countries, although not protected by import duty on ultramarine, so that large quantities are imported from France and Austria. There are a few factories in this country, but they are not able to supply the home demand.

Artificial ultramarine was first prepared in 1828 by Guimet in Toulouse, and simultaneously by the celebrated German chemist Gmelin. The contest for priority of the discovery was settled by the late R. Von Wagner, by means of documentary evidence showing that the discovery was made independently by both. (The editor of the *Chemiker Zeitung* considers Gmelin's priority to have been very positively established.) Simultaneous discoveries in chemistry have been frequent enough, as in case of chloroform, gun cotton, and even oxygen.

Before artificial ultramarine was discovered, the natural ultramarine was made from the costly lapis lazuli, by a tedious method of grinding, washing, floating, and purifying, so that it cost then $225 per pound. Its use was very limited owing to its price.

The chemical composition, according to Clemens, and Desormes, is as follows:

Silica	35·8 per cent.
Alumina	34·8 "
Soda (NaO)	23·2 "
Sulphur	3·1 "
Carbonate of lime	3·1 "
	100·0

While the process which Guimet discovered for making ultramarine remains a secret to the present day, Gmelin at once published his discovery and observations, and thereby became the creator of the German ultramarine industry.

Gmelin's publications in Liebig's *Annalen* induced many other scientific men to institute investigations into the theory of ultramarine production, but up to the present time no satisfactory theory has been established. For a closer study of the subject Rohrig refers to the excellent essays of Ritter and Ebell. Gmelin's discovery at once furnished the technical chemist with an impulse to institute experiments for making a practical use of the discovery. Each strove to invent for himself a practical method for making artificial ultramarine on a large scale, and in this way the different ultramarine factories of Germany have been gradually called into existence.

The earliest of these factories was that of Leverkus, established in 1834 in Cologne, and next that of Leykauf in Nuremberg, founded in 1837, in both of which a more or less independent process of manufacture was built up. And even at the present time each separate factory has its own special peculiarities of manufacture, some of which are more or less important, with others that are perfectly non-essential.

There are two kinds of ultramarine, known as sulphate ultramarine and soda ultramarine. They differ from each other in their external appearance, in their properties, in the methods of preparation, and in the raw material from which they are made.

The raw materials used in making "sulphate" ultramarine are kaoline clay with but little silica, sulphate of soda, sulphur, and resin or coal; those employed for soda ultramarine are silicious clay, quartz or infusorial earth, soda, sulphur, and resin. The proportions of each to be used will depend upon the shade and quality of the ultramarine to be produced. For example, an increase of sulphur deepens the color, more silica will better enable it to resist acids and alum, and gives it a reddish shade, while less sulphur, with but little silica, gives a light blue of little coloring power and unable to resist alum. The sulphate ultramarine has less resistance for acids, yet has greater coloring power, and the color shades toward green.

The manufacture of ultramarine embraces the following operations:

1. *Preparation and Mixing of the Raw Materials.*—The clays are ignited more or less strongly according to the requirements of ultramarine, and then ground as finely as possible by means of millstones, and the quartz likewise, if it is used. After the clay has been mixed with the other substances they are run one or more times through the millstones to secure an intimate and thorough mixing.

2. *Igniting or Burning the Mixture.*—This is mostly done in crucibles placed in rectangular furnaces with fire beneath or in muffle furnaces, and in a few cases in retort furnaces. The heating differs with the mixture and the furnace. The sulphate mixture, for example, requires a much greater heat in burning than the mixture for soda ultramarine, for it requires an orange-red heat to convert sulphate of soda into sulphide of sodium, while soda ultramarine is formed at a much lower temperature.

The chemical changes in this process take place in two stages; in the first, Ritter's white ultramarine is formed; a silicate of soda and alumina, which contains sulphide of sodium, either mixed or chemically combined. A polysulphide is likewise formed, which is mixed with it mechanically.

In the second stage, which begins as the furnace cools and the reducing gases disappear, the mechanically intermixed polysulphide is oxidized by the air to sulphate, and the white ultramarine changes to blue.

An intermediate stage is the production of green ultramarine, which is formed more largely in burning the sulphate ultramarine, because the white ultramarine, or mother substance, does not contain enough polysulphides to make a blue. To convert this green ultramarine into the blue requires special roasting with the addition of sulphur. Green ultramarine also finds considerable use directly as a pigment. Soda ultramarine made as above is perfectly blue at first.

3. *Washing the Crude Ultramarine.*—This operation is necessary in order to remove the soluble constituents (sulphate of soda and dirt) from the crude product, and is accomplished by boiling it separately in distilled water heated by steam.

4. *Grinding the Crude Ultramarine.*—Its power as a pigment is developed by grinding. The finer it is ground the greater its power and the lighter shade. It is ground on wet stones.

5. *Floating the Ground Ultramarine.*—This operation separates the coarser from the finer particles; the coarse grains have a darker color but less power than the finer ones.

6. *Drying the Ground Pigment.*—This is accomplished in kilns of various construction.

7. *Preparing the Dried Pigment for the Market.*—As it becomes somewhat packed in drying, it requires to be broken up and sifted. It now only requires suitable adulteration to fit it for the market.

Induration of Soft Limestones with Fluosilicates.

The use hitherto made of alkaline silicates to harden limestones is far from satisfactory; it leaves the stone impregnated with soluble salts which are only expelled after long exposure to rain. These salts of potassa and soda rapidly nitrify, and assist the growth of fungous bodies for which the potassa salt is a manure. Another mischievous consequence, resulting from this process, is the formation of an enamel impermeable to water upon the surface of the stones which have reached a point of saturation with the alkaline wash, and this enamel upon the arrival of frost imprisons the water, which freezing underneath this obstinate varnish forcibly detaches the glassy coating and breaks and injures the underlying surface. M. L. Kessler has apparently succeeded in replacing this indurating bath by a solution of fluosilicates of bases whose oxides and carbonates are insoluble in a free state.

When soft limestone is saturated with a concentrated solution of a fluosilicate of magnesium, aluminum, zinc, or lead, a degree of induration is soon reached which is very considerable. In fact, except the liberated carbonic anhydride there is formed only fluorspar, silica, aluminic oxide, and carbonates of zinc and lead or fluoride of magnesium, all of which are less soluble than the limestone itself. No varnish is formed and therefore no danger threatened from the expansion of frost underneath it, the process has perfectly resisted the severe tests of winter, and this method of silicification is only slightly more expensive than the old process it is intended to replace.

It possesses unexpected advantages. It is frequently valuable to give to the surfaces of soft limestones the appearance and the polish of the hard marbles, if only to avoid the settlement of dust and soot upon their rough surfaces. In order to smooth and polish the coarsest limestone it answers to coat it with a paste made of the pulverized stone and water, and after drying to impregnate it with the fluosilicate chosen for its lapidification. It forms a homogeneous body finely granular in texture, and as hard and refractory as the stone itself. It is only necessary to take some very simple precautions to avert the carrying away of fine dust in the beginning of the operation, caused by the rapid disengagement of carbonic anhydride. The skill in its application consists in flowing the solution in a thin film over a surface sufficiently dried.

When a coloring substance insoluble in water is mixed with the paste, a very variable and interesting series of decorative effects are secured. Finally, by employing colored fluosilicates, as those of copper, chromium, iron, etc., the limestone is colored even in its interior by the formation of insoluble compounds. These colors follow the intimate construction of the stone and afford designs of considerable beauty.—*Les Mondes.*

The Value of String.

Perhaps it is natural instinct that makes the "small boy" tie up to a piece of string. But the possession of string in an emergency is the subject of more than one truthful although romantic tale. The descent of a workman left on a chimney, by means of a string to pull up a rope, is familiar, and the stretching of a connecting cord across a Virginia chasm by means of a kite, saving three persons from the fate of Indian captives, in the early days of the country, is remembered. But a better because nearer exhibition of the value of string was given in New York city on the occasion of the fire at the Munro buildings in Rose Street. Fourteen firemen were cut off in the upper stories of the building by a "back draught," which surrounded them suddenly with smoke and flames, and cut off their retreat by the stairs or fire escape. They crawled on their hands and knees to a window and called for help, but the noise in the street prevented their cries from being understood, it being thought by those below that they were calling for more hose, and preparations were making to send it up to them. Meantime they were in danger of being suffocated, and the flames were gradually advancing upon them. Finally Chief Gicquel saw their peril, and a ladder was raised for their rescue, but it was too short. Finally one of the imprisoned men found a piece of string, which he lowered to the ground, a life line was drawn up, speedily made fast inside, and the men began their descent to the ground. One of them was so faint from exhaustion that he was unable to clasp the rope, and slid down it some fifty feet, lacerating his hands terribly. He was caught at the bottom by a companion, and saved from further injury. The others reached the ground in safety, but scarcely had they done so when the flames burst from the windows they had just abandoned.

An Editor's Experience with Lightning.

Mr. H. M. Burt, editor of *Above the Clouds*, published at the Summit House, Mount Washington, N. H., writes to a friend in Hartford, Conn., detailing his experience with a bolt of lightning. He said that he was in his office at about six P.M., July 28, when he felt a tremendous blow in the back. "I could not imagine at first what caused it, but instantly thereafter I saw a ball of fire as large as a man's head in front of me, not three feet off. It exploded with a tremendous noise, seemingly as loud as a cannon, and then I knew what must have happened. My left leg seemed to be completely paralyzed, and I fell to the floor. Three of my printers were in the room at the time, two sitting at the table near me and one standing up a little further off. The latter had the skin on one hand torn up, another was hit in the back, and the third escaped without injury."

Mr. Burt gradually recovered from the temporary paralysis induced by the electric stroke, and he winds up his account by saying: "You have probably heard of the impression of a tree being found upon the bodies of those killed by lightning. The same thing was noticed upon my back, and, as there are no trees upon Mount Washington, it seems to me that the peculiar appearance must be the result of the blood settling in the smaller veins."

DR. HENRY MACAULAY, M.D., of Belfast, has recently made a suggestion which, if followed in tropical countries, will turn the tables on the sun with a vengeance. He suggests that Mouchot's sun engine should be used to pump cold air into dwellings, factories, etc., pointing out that the temperature, can in this way be reduced from 100° or more to 60°. He points out that not only will this reduce the temperature especially at night, thus rendering sleep possible, but fresh air will be guaranteed during the day, and the plague of flies and insects would be excluded. The weak point about this arrangement is that it requires ice. We think, however, adds *Nature*, that sooner or later in America where the heat in summer is more distressing than in any other part of the world, and ice is everywhere, this arrangement, or one like it, is certain to be adopted.

Steel Nails.

At first the extra cost of steel nails was one and a half cents per pound, or $1.50 per keg, but it has now been reduced to $1. The great advantage of the steel nails is that they can be driven into hardwood as easily as an iron nail will go into a pine board. Steel nails have been driven into a white oak knot without bending. Nothing else is now used in laying hardwood floors, as they require no boring, but are driven readily. For all kinds of finish they are especially adapted, and as so much hard finish is now employed, their use must be on the increase. They are also used largely by builders, and box makers are increasing their demand for them. Box makers have been using the better grades of iron nails, as they desire those that can be drawn and redriven.

Dakota Enterprise.

The following newspaper item well illustrates the rapid utilization of lumber in new sections of the country: "Towns grow out West. A denizen of La Bean, Dakota, was recently asked what the population of that town was, and he replied: "Well, the first lumber was received two weeks ago last Sunday. Now there are six general stores, one dry goods store, one hardware store, five saloons, one meat market, three lumber yards, one bank, one newspaper office, one telegraph office, a post office (with 280 calls and 80 lock boxes of the Yale pattern, in a building 20x30, two stories high), two hotels, and some other structures. Since then there has been started another bank, a 50 room hotel, a hardware store, a dry goods house 30x80, and a Presbyterian church."

Over the Ocean on Wheels.

A dispatch from London, dated July 29, says that Terry, the man who left Dover at 9 o'clock yesterday morning on a floating tricycle, crossed the English Channel and arrived safely at Calais at 5 o'clock in the afternoon. His machine was a tricycle of two side wheels of large diameter and one steering wheel of smaller diameter, each of them buoyant by a hollow composition of water-tight material. The propelling power was his own legs, the larger wheels being furnished with paddles at proper distances on their peripheries.

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Correspondence.

Storage of Wind Power.

To the Editor of the Scientific American:

Upon reading your first article offered by W. O. A., on the storage of wind power, a plan occurred to me which would do away with the engine, which I suppose would be necessary if you took power from compressed air; my plan is to raise a heavy weight in a shaft, running from the ground to the roof, the size of weight to be determined by the amount of power required. I would have wind wheels attached to weight by proper gear, so that we could wind up power at the same time we were using it, and have two or three days' power in advance, which would be imparted to machinery upon the clockwork principle. The idea seemed to me very simple. F. N. DAVIS.

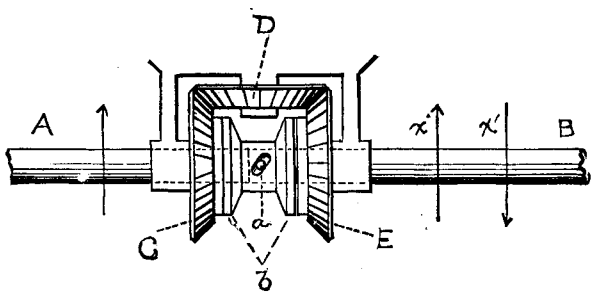
Calais, Me., July 24, 1883.

Rotary from Reciprocating.

To the Editor of the Scientific American:

While developing an invention several years ago, I had occasion to make use of a mechanism which would give me a one-way rotary movement from a reciprocating rotary motion. Not being able to find such, I devised one; and never having seen anything like it anywhere, or the same movement effected in any other way automatically, I deem it may be new, and if so, of use to some of your mechanical readers.

In the cut, B is the power shaft, and A the transmitting shaft, the separation of the two being indicated in dotted lines. Bevel gear, E, is free upon shaft, B, idle wheel, D, is loose upon its axle, and C is fast or keyed to shaft, A. The double forced grip or frictional adherence "clutch," *b*,



is free to move longitudinally upon both shafts. Projecting from shaft, B, is a pin, *a*, or may be a tongue free to slide smoothly in a slot or recess set at an angle, formed into said "clutch." Now, when B is rotated, as shown by arrow, *x*, the transmitting shaft, A, has the same movement as to direction and speed, and when B reverses, as per arrows, *x'*, the "clutch" shifts instantly to bevel wheel, E, in which case the shaft, A, is driven as before; and from the reciprocating rotary motion of B we get a one-way rotary movement of A. The promptness with which the shifting of *b* is made is dependent upon the pitch of the angular slot and the clearance of the frictional adhering surfaces. S. D. MOTT.

59 Astor House, New York.

How to Get Rid of Red Ants.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of July 14, I noticed among the Notes and Queries (No. 1) the question: "What will kill, remove, or destroy the small red ants?" The reply was, greased paper. I tried greased paper for many seasons, but the ants returned again with every summer.

For four years I have used water treatment, and have not seen an ant since the first year of using water. If the ants come in at the pantry window, wet several folds of old cotton cloth, and lay it the whole length of the outside window sill, occasionally pouring water over the cloth, and this will effectually prevent the ants from entering.

Ascertain where they come in, and treat them with the wet cloths. They cannot crawl over anything wet.

Z. H. SPOONER.

Plymouth, Mass., July 25, 1883.

Prehistoric Man.

Professor Marsh contributes a paper to the *American Journal of Science* for August in regard to the reported finding of human footprints in sandstone near Carson, Nevada. He says that many different kinds of tracks were found, some of which were made by an animal allied to the elephant; some resembled those of the horse and the deer; others were apparently made by a wolf. There were also tracks made by large birds. The supposed human footprints are in six series, each with alternate right and left tracks. The stride is from two and one-half to over three feet in extent. The individual footprints are from eighteen to twenty inches in length, and about eight inches wide. The distance between the line of right hand and left hand tracks, or the straddle, is eighteen to nineteen inches. The size of these footprints, and especially the width between the right and left series, are strong evidence that they were not made by men, as has been so generally supposed. A more probable explanation is that the impressions are the tracks of a large sloth, either *Mylodon* or *Morotherium*, remains of which have been found in essentially the same horizon.

[SAN FRANCISCO CHRONICLE.]

The Coining Process at the San Francisco Mint.

There have been but few registered visitors at the mint since that time, but a reporter, unobserved, passed in among the number and commenced his annual investigations. A number of bars of bullion were the interesting objects first pointed out by the conductor to his visitor. After that introduction of the subject of money making he continued his interesting narrative, detailing every process in the coining of a dollar, from its receipt as metal of an uncertain value to its issuance for circulation. Bullion is received in the form of bricks of all sizes and very peculiar shape when it comes from Spanish American countries. The regular shaped bricks often weigh as heavy as 150 pounds.

The Mexicans melt their silver and run it into the most crude shaped moulds in the world, in quantities so large and heavy that a burro could not carry one casting. It seems strange at first to think of these indolent people performing a very troublesome and laborious operation only to find themselves confronted with more labor. There is good reason, however, for the large castings. If the valuable metal were carried in quantities convenient for handling, raiders for miles around would be after it and demand the whole or a large portion of the silver as salvage for protection against other raiders. The Mexican silver received at the mint is taken to the machine shop and cut up before it is in shape to be put into any of the largest crucibles. The regular shaped bricks are taken first to the assay office, where the diagonally opposite corners of opposite surfaces are clipped and the brick bored into both ways. An assay is then made of the clippings and borings. The result of an assay is made known to the person making the deposit in about twelve hours. He gets his money and the government gets his bullion.

After the assay the bullion passes to the refinery if it should require the operations there performed. It is melted in the refinery and poured out on water. There is a great sputtering for a few moments, and then a result called "the granulations" is perceptible. The solid molten mass has become scattered in particles of many sizes and indescribable shapes. The general appearance is that of the fallen leaves of forest trees which have become crisped up by the frost. The granulations are then weighed and put into large caldrons of ironstone china about the size of a barrel. The caldrons are valued at $100 each, and the men working about them are very careful in their movements lest they should damage or destroy one. The caldrons are set in rows on a false floor, under which pass steam pipes. Water flows around them to the height of about a foot. A quantity of muriatic acid is then placed in the caldrons proportionate to the amount of granulations. They are then closed in or surrounded by a tight box or house. Steam is admitted to pipes beneath the false floor, and the steam heats the caldrons and their contents. The red fumes at the chimney tops are generated in this process. This heating reduces the granulations to a fluid state if they are silver, but gold remains solid in granulations if part gold and part silver. The fluid is drawn off by a siphon and deposited in tanks about twelve feet in diameter which contain a stirring apparatus driven by steam power.

Common salt is then placed in the solution to precipitate the silver. It is deposited as chloride of silver, and the liquid is drawn off through filters and allowed to flow away. The chloride of silver precipitate is about the consistency of a mason's putty coat, and resembles it very closely in other respects. The acids are then cleansed out by washings in what is well known as the sweetening process. When the silver has been obtained in a state as near as possible to absolute purity it is taken to the press room, and by hydraulic pressure compressed into solid circular masses of from twelve to fifteen inches in diameter and five inches thick, resembling very much the shape of a cheese. The silver is then placed in an oven in iron pans. A fire is raised and the iron and oven are brought to a cherry red color for the purpose only of driving off moisture in the chloride of silver. The least portion of moisture in the crucibles would break them, and the silver would be lost in the ashes. The cakes next go to the melter and are run into bricks. If it goes on the market as bullion, its weight in ounces and its value is stamped upon each brick. If it is to be turned into coin, it is again melted and an alloy of one-tenth copper is put in both for silver and gold, and the whole is then run into ingots.

These are heated and rolled to the proper thickness and width, and the strips are then annealed and whitened. The blanks are next punched and cleansed of the grease from the rollers, and are then sent to the adjusters. Each piece is weighed and if found too heavy a little is filed off the edge; if under weight, it is remelted. From the adjusters the blanks pass to the stamping room. The milling, as it is generally termed, is then put on, but not at all according to the popular idea. If the blacksmith's homely but expressive word of "upsetting" were used instead of milling, there would be but little doubt as to the process.

After it is upset, to raise the ring on the surface, the blank passes under the die. The impression is made on both sides from one blow. The milling is in reality by pressure—squeezing the silver out into the little grooves of the mould. A rule of the coiner's department does not allow an employe to leave it during the day until after the accounts are adjusted. From the coiner the money passes to the counter, who with the aid of a counting board, which holds an exact number of pieces, is able to count thousands where a person ordinarily would count only units. The counting board carries just 1,000 silver dollars. One of the most interesting objects to be seen in the mint is a large balance scale, so nicely adjusted that one may take a hair from the head, split it and place it on one of the scale pans, and the beam will be noticeably deflected. Only dollars and "twenties" are now being coined, but there is money enough on hand in the mint to make half the town rich. There is more money than can be handled. The reporter noticed the heavy doors for a new vault which is to be constructed as a strong place for the excess of coinage. There is $15,000,000 in one vault, $8,000,000 in another, and $6,000,000 in another, besides bullion which will turned into money as soon as the new vault is completed.

Eruption of a Volcano in Lake Nicaragua.

During the past three or four months the extinct volcano of Ometepe—an island in Lake Nicaragua, twenty miles long—has given signs that it was about to burst into activity. Smoke, flames, ashes, pumice stone, small lava flows, and all the accessories which mark a complete volcanic outlet have been seen. The inhabitants of the island have been frightened, and for leagues around on the mainland the people have been in a constant state of excitement, as is proved by the following interesting relation given in the *Panama Star and Herald*. On June 19, for the first time, the lava streamed from the new crater and ran in the direction of Las Pilas, but until the 22d it had not reached the main road at Sinacapa. On the night of the 20th the sides of the mountain were alive with fire as the lava poured down, sweeping with it trees, rocks, and earth, while the continued bellowings of the volcano struck terror into the hearts of all who heard them. On the 23d, the whole island was continually quaking, many of the inhabitants fled, and the authorities commenced preparations for the removal of every one from the island. On the 24th the lava bed had covered up the road, and two young men who had gone with others to watch the flow had been buried under it. The lava continued to pour out in an almost uninterrupted stream, but up to the 25th of June it had not reached the shore.

On the 26th a panic set in among the populace caused by the prolonged and incessant rumblings, the torrents of lava, and the clouds of ashes and dirt which continually issued from the mountain. In consequence schooners and boats were sent to the island to transport the people to Granada, Rivas, and other cities. The lava flow on Tuesday, the 26th, took a new direction, and pouring down within a mile of the town cut off communication with the farms and pastures upon which the islanders depend for their living. On the 27th and 28th the eruptions were horrible in their intensity, and led to the few remaining people fleeing to the mainland. Boiling lava and mud and ashes and rocks now cover the sides of the mountain and the pleasant slopes which have been cultivated for centuries by the peculiar and ancient race which inhabited the island. The view of the volcano when in eruption is said to be one of surpassing grandeur. Clouds of smoke sweep upward, through them flash glittering masses of burning, half molten rocks, which shatter into a thousand fragments on coming into contact with the cold air, while underneath there swells, bubbles, and throbs the ever-surging mass of red hot lava destined to carry ruin to the villagers who have hitherto lived on the flanks of the volcano. Although the ground is in a continual tremor no earthquakes have been experienced, and the clouds of ashes which constantly rise do not trouble visitors to the island. The strong winds sweep them over to Rivas, where land owners are becoming alarmed at the prospect of their crops being damaged.

Experiments with Peas.

Experiments have been made this season, at the New York Agricultural Experiment Station, at Geneva, N. Y., on the period of growth of peas and the relative value of seed matured from the earliest and the later pods. It appears from experiments with sixty-eight so called varieties the earliest edible pods were obtained in fifty-five days from planting, and of fifteen others the latest required fifty nine and a half days. Of seed peas gathered from the first pods and from the latest pods, the average difference in the vegetation of the seeds was fourteen and one-half per cent in favor of those earliest matured, and in favor of earliest production of edible peas a difference of five days in favor of the earliest matured seeds. In productiveness, also, the difference in favor of those from the earliest matured seed is considerable, from an equal number of plants the earliest seed vines producing in the same time thirty-eight well filled pods to only thirteen well filled pods from the later matured seed.

Postal Notes.

It is only a month before the public will have the new postal notes, the limit of their preparation being September 3. They will prove to be a great convenience, as the sender can transmit any sum from one cent to five dollars. The New York *Tribune* illustrates the convenience of the new arrangement by stating that "a lady living out of town who wants to send $3.79 to a drygoods store in New York will hand that sum, and 3 cents fee, to the postmaster. He will give her an order with the figure three punched in the dollar column, the figure seven in the column of dimes, and the figure nine in the column of cents. This is simple and easy, and offers no chance for fraud."

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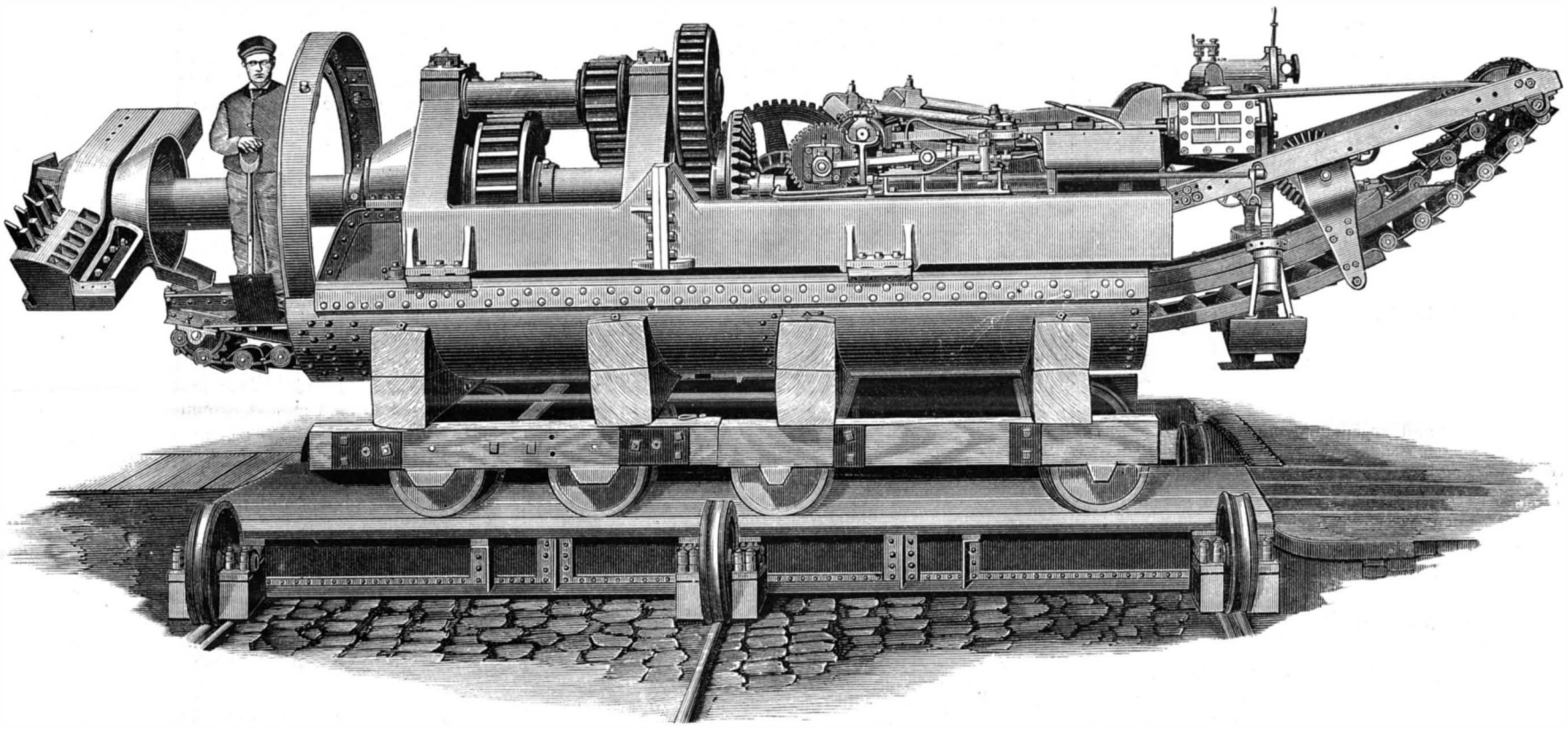
TUNNEL BORING MACHINE.

The illustration of the boring machine for tunneling the English Channel, herewith shown, is from a photograph furnished by Mr. Thomas English, the patentee of the invention. The main framing of the machine consists of two parts. The under frame or bed is of trough like form; fitting the lower part of the circular tunnel, and having at its upper edges suitable guides parallel to the axis of the tunnel, along which the upper part of the framing is fitted to slide longitudinally.

On the upper frame the axis of the boring head is mounted in bearings with gearing and an engine worked by compressed air, so as to cause the boring head to revolve slowly. The axis of the boring head extending backward is made tubular and fitted with a piston, the rod of which projects backward and is fixed at its end to the under frame or bed. An air engine works hydraulic pumps, whose throw can be varied at will, forcing water into the hollow axis of the boring head through a channel provided within the piston rod, and thus causing it to advance while it revolves. When it has advanced as far as the length of the guides permits, the gearing by which it is revolved is disconnected from the engine, its axis is relieved from the hydraulic pressure, and by means of four hydraulic jacks projecting down from the upper framing and made to bear against the lower part of the tunnel, the whole machine is slightly raised. The water under pressure is then admitted into the annular space round the piston rod, and while the upper frame remains stationary the under frame or bed is caused to advance under it, after which the lifting jacks being relieved from pressure allow the bed to take its bearing in its advanced position, and the boring head is again put in motion forward.

The boring head consists of two strong radial arms projecting in opposite directions from the axis, each arm having through it a number of cylindrical holes to receive tool holders which are clamped therein by keys, and any of which can be withdrawn backward for the purpose of repairing or replacing their tools. The cutting tools are so arranged as to cut concentric annular chases in the face of the rock, leaving between them narrow portions of the material, which can be readily broken away, or which crumble away while the machine is at work. Within the trough hollow of the bed are arranged inclined worms which cause the excavated material to travel backward and upward, so that it is delivered behind the machine into trucks, by which it is removed from the tunnel. We are indebted to the *Engineer* for our cut and the above particulars.



IMPROVED BORING MACHINE USED IN THE CHANNEL TUNNEL.

The Refuse of a Great City.

In New York the garbage and ashes are placed in boxes and barrels on the sidewalks and removed *daily* by the carts of the Street Cleaning Department, which haul them to the nearest department dock, where they are dumped on scows; and these scows are towed out to sea in deep water and there emptied.

The street sweepings are disposed of in a similar manner.

The offal, such as dead animals and diseased meat, comes within the province of the Health Department, which lets out by contract to certain parties the removal of this material from the entire city. For this present year this work is done for $40,000. The offal is taken by the contractors to Barren Island and then converted into fertilizers.

Two kinds of street sweeping machines are used, says *Engineering News*, one made by the Chapman & O'Neil Manufacturing Company, at No. 291 Avenue C, New York, and the other, called the "Boston machine," made by the Abbot-Downing Manufacturing Company, of Concord, Mass. A single horse machine costs about $350 to $400.

Exhibition of Insects.

The exhibition of insects lately opened at the Palais de l'Industrie, is the twenty-sixth exhibition of insects held in Paris under the auspices of the Societe Centrale d'Apiculture et d'Insectologie, the object of the society being to classify and improve the insects useful to man, and to point out the best means of extirpating the noxious ones, or at least of checking their ravages. The association, at the head of which is Dr. Marmottan, deputy for the Department of the Seine, has succeeded very well in its attempts, and the exhibition this year is, says the *American Register*, organized on a very complete scale, being composed of four main divisions and one subsidiary one (devoted to snails and slugs). The first division comprises all insects of recognized utility to man, and the various stages of their development, from the egg to the perfect state. The second division contains noxious insects; they have very advisedly been classed, not according to the scientific grouping, but according to the plants they prey upon. There are ten classes in the noxious division, the first six of which include the parasites of vegetables and trees; the seventh and eighth contain the insects which prey upon timber and upon manufactured materials, silk, linen, etc.; the ninth class comprises the ordinary parasites, such as the flea, etc.; and the tenth the insects injurious to pisciculture. The third division groups together all the birds, animals, and reptiles which tend to destroy the harmful insect, and thus act as friends to man. The fourth division is devoted to the arts and manufactures more directly connected with the cultivation of insects. The principal features of the exhibition are naturally the silkworm and bee, with their various methods of culture, products, etc. Apiculture is not very largely represented at the exhibition of insects, and if the bee industry is not better carried on in France than would seem to be the case from a visit to the Palais de l'Industrie, there is room for improvement in this respect. Sericulture, as the French term the rearing of silkworms, is also inadequately represented at the exhibition; indeed, the only silk grower of any importance there represented is Baroness Hérold de Pages, who owns a large *magnanerie*, or manufacture of silkworms, at Lourmaria, in the Department of Vaucluse. The show of bee hives is good enough, and the honey exhibited is of very fine appearance. Butterflies and beetles, some of them classed as noxious and others as useful, are very numerously represented. The section of snakes and lizards (exhibited on account of their relations to insects—the relations of the destroyer and the destroyed) is more complete than might have been expected. The owl, so fatal to mice and rodents in general, stands all by himself in a post of honor, while the rodents who destroy grain are pilloried in cages.

Heating and Ventilating a Dwelling.

The London *Lancet* describes an experiment recently made by Dr. Hogg, of Chiswick, in warming, cooling, and ventilating a dwelling. The house has not been built long enough to thoroughly test the means for cooling the compartments, but the warming and the ventilation work admirably. "None of the windows can be opened. There is but one fireplace, that in the kitchen. Underneath the hall a large passage is used as the intake of fresh air. Here it can be cooled in summer by ice or water spray, while in winter it is warmed by hot steam pipes, which are economically heated by a small coke stove. The air then passes up into the hall, from which it is only separated by an iron trelliswork, and travels into every room of the house by apertures made in the skirtings and cornices. In the ceiling of each room there are one or two openings and exhaust shafts, leading to the foul air chamber in the roof of the house. To produce the exhaust suction a large shaft runs from the foul air chamber down to the back of the kitchen fire, where the heat of the boiler and the fire suffice to attract the air. From the back of the kitchen fire, in the basement of the house, the air again travels up. A square brick shaft or chimney conveys it through the roof and into the open. In the center of this shaft is a circular metallic flue, which carries away the smoke of the kitchen fire, and this flue, always more or less heated, stimulates the current of air. A comparison of the minimum velocity at which the air moves forward in the extracting flues (200 feet per minute) with the cubic contents of the house, shows that the atmosphere is entirely changed throughout the dwelling once in every twenty minutes. This result is obtained imperceptibly—that is, without the slightest draught; yet ten persons smoking in one room felt no inconvenience, and next morning there was not the slightest trace or taint of tobacco odor remaining."

It is claimed that in addition to the equal heating of the entire house, the cost of fuel is reduced one-third from that of the ordinary method. But as the common way of heating houses in England is by open grates, this proportion might not be applicable to the American system of furnace or stoves.

The Mineral Riches of Tonquin.

Its gold mines, says a writer in the Paris *Figaro*, can rival those of California and Australia. The natives use that metal for exchange; the females of the Muongs of the Black River, on their way to and from market, gamble with thousands of francs' worth of it, without caring whether they win or lose. The mines of Talan, near Yuen-Kiang, on the Red River, were visited by the Commission of the Meikong, who found gold there in bars as well as dust. Still higher near the source of the Red River, the precious metal is obtained in large quantities. Silver also is not rare, and copper is found everywhere, all the domestic utensils of the people being made of this metal. The tin mines are not worked for want of capital, although those worked near Mong-tsze, in Yunnan, near the Red River, are the most valuable known to exist. Zinc, lead, iron, and bismuth are also known. The coal mines, however, are the most important of all. Tonquin produces also musk, tortoise shell, mother-of-pearl, wax, silk, peacocks' feathers, as well as those of the blue pheasant, and other birds of brilliant plumage. "In short," concludes the *Figaro*, "it is a rich country, and worth the trouble of occupying it."

Oily Substances in Rice.

According to G. Campari ("Annals of the Milan Society of Applied Chemistry"), oily substances are contained in large quantities in the embryo of the rice, which he finds to be composed of 95·54 per cent of fatty acids, and 4·46 per cent of glycerine. Treatment with bisulphide of carbon produces a yellow wax-like substance which readily saponifies with bases, melts at 32° C., becoming quite solid at 28° C., with a specific gravity of 0·93005. It is completely soluble in ether, chloroform, and benzine; its composition appears to be C 79·2, H 10·9, O 9·9 per cent. The fatty acids melt at 36° C., emit a perceptible pear-like odor, and yield, when saponified and heated with magnesium acetate, a body which melts at 62° C., and exhibits the composition of palmitic acid—$C_{16}H_{32}O_2$.

THE pine forest along the Adriatic at Ravenna, Italy, celebrated by Dante and Byron, and which furnished the shipyards of Rome and Venice, are to be cut down, because an excavation for a railroad has so drained the soil that the rees have died.

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GREAT LOSS IN THE DIAMOND FIELDS.

The late unfavorable news from the African diamond fields has been the cause for quite an advance in diamonds both in European and American markets. The excellent illustration of the great mine at Kimberly, which together with our facts is taken from the *Jewelers' Journal*, renders the description more graphic.

Mr. H. B. Joseph, one of the passengers by the Austrian bark, Lea, just arrived at New York from Cape Town, and who is a Cape commission dealer in diamonds, copper, wool, etc., tells most distressing tales of the great sufferings in Cape Colony. In parts of the country, he says, there has been no rain for three years, and the people are starving. The condition of affairs in Cape Town, at Kimberly, Du Toits Pan (the diamond fields), the Leydenburg gold fields, the Orange Free States, and surrounding country is worse than it has been for years. What adds to the general distress consequent on the failure of the crops, is a disaster at the great diamond mine at Kimberly, 600 miles up from Cape Town and 400 miles from Natal. The mine is 380 feet deep and 1¾ miles in circumference. The soft debris has fallen back into the mine in such quantities that it is estimated that eighteen months will be required for its removal.

Upward of 4,000 tons fell within twenty-four hours. The extent of the calamity can be judged by the fact that this celebrated mine has yielded $15,000,000 in diamonds a year. The effect at Cape Town has been most disastrous. The revenue has fallen off 50 per cent, and the mining shares have gone down to 75 per cent. It is estimated, said Mr. Joseph, that it will cost $1,250,000 to clear the mine. The fall in the prices of diamond shares has ended in a great tragedy. There are sixty-five diamond mining companies, with a subscribed capital of $35,000,000, and of these companies only fourteen are paying dividends. Most of these mines are within a radius of 150 miles, and at an average of 600 miles from Cape Town. The extent of the commercial convulsion is illustrated by the Great Central Diamond Company. It has a subscribed capital of $4,500,000, and paid taxes on $4,200,000. Two years ago the shares were rated $1,800 each, but to-day they are worth only $400. The Frerers' Diamond Mining Company at De Beers, a quarter of a mile from the Kimberly mine, with a subscribed capital of $650,000—$500 a share—has been sold out by the sheriff for $75,000 for rates owed to the mining board. Mr. Herm Wilegroot, a leading merchant, blew out his brains on account of all these troubles, and two weeks afterward Mr. S. R. Schonz, resident magistrate, killed himself. Altogether, there have been about ten suicides of leading men caused by the commercial depression. The most terrible stories of starvation come from the copper region, especially from the neighborhood of the Manamaculand mines. Capt. Segarich said that commercial circles in Cape Colony are so greatly depressed that many of the colonists are returning to Europe, especially to England. He said he could have brought many more passengers if he had had room.

If these reports prove true, there is no doubt but that the recent advance of from twenty-five to thirty per cent in diamonds will be followed by others, and those dealers who have bought before the rise will be among the most fortunate of the trade.

Perhaps there is no place in the world where wire rope tramways are employed to so great an extent as in the spot represented in our engraving. It will be seen that the ropes extend in great numbers to the banks on either side of the fields, where the earth is deposited in vehicles of various sorts, and from whence it is conveyed to more roomy quarters to be picked over or washed.

The engraving shows that some of the claims have been worked to a far greater extent than others, some of the miners having made deep excavations, leaving the mines of others actually above the average level.

VIEW IN THE DIAMOND MINES, SOUTH AFRICA.

Genius, Talent, Industry.

"Talent" is a quality which enables its possessor to acquire knowledge by learning from others and by unassisted study.

"Genius," on the other hand, is characterized by a great independence of instruction; it takes its own course, and originates new ideas and inventions never thought of before. It may of course enlarge its sphere of knowledge by reading, by observation, and by experiment; but it is by no means characteristic of genius to be apt to be taught; on the contrary, embryo geniuses are often dull fellows at school and idle to boot. It rather dislikes to follow in the track of others, and rises superior to obstacles of circumstances and deficiencies of education. Genius may safely be left to hew a path for itself. Talent is greedy of instruction. Hence the two have very different relations to education, a subject upon which I should much like to dilate, but the length into which I have been unintentionally betrayed warns me to avoid the temptation.

Arkwright perfected his invention of the spinning frame in the uncongenial atmosphere of a barber's shop, in the teeth of a scolding wife who more than once broke up his models on the eve of completion, and who habitually upbraided him for neglecting the profitable occupation of "an easy shave for a penny," with the elegant apostrophe, "Cuss the 'cheenery!" I believe she lived to be Lady Arkwright. Let us hope that she learnt to moderate the rancor of her tongue.

George Stephenson, inventor of the locomotive and the father of railways, developed his extraordinary engineering genius in the obscurity, physical and metaphorical, of a coal pit; eking out his slender earnings by mending the boots of his fellow workmen and occasionally a watch or clock.

Sir Humphry Davy, who was described as an "idle and incorrigible schoolboy," was apprenticed to an obscure apothecary in Penzance; he afterward became assistant in the laboratory of Dr. Beddoes, of the Hotwells, Bristol, well known to my father, who was then serving his apprenticeship at the same place, but I cannot discover that he knew anything of the Doctor's more illustrious subordinate.

Faraday's father was a Yorkshire blacksmith, who migrated to London, presumably in search of work, and Faraday himself was apprenticed to a bookbinder. A chance attendance upon four lectures by Sir Humphry Davy was the immediate cause of his directing his attention to science, and he was some time after introduced to the Laboratory of the Royal Institution through Davy's instrumentality.

Benjamin Franklin made his first entry into Philadelphia, a poor lad, with all his possessions upon his back and a dollar in his pocket. As Mark Twain depreciatingly remarks, "Anybody might have done that; the only difficulty is to have the dollar." But how few out of the millions who have begun life with a dollar, or even with less, have arrived to be Franklins!

On the other hand, it seems absolutely immaterial with what seemingly insuperable disadvantages genius may be oppressed; it *will* make its way to the surface and triumph over all.

Can industry then supply the place of genius? Emphatically, No! Industry may compensate for paucity of talent; for talent, as we have said, is a common heritage, and its presence or absence is a matter of degree, and whatever results are attributed to talent are the joint product of talent multiplied by industry.

"Genius" is as a living organism, instinct with its own life, performing its appointed functions spontaneously, as of necessity.

"Talent" is an elaborate engine, skillfully devised to move many wheels and to perform divers works, but wanting the motive power.

"Industry" is the motive power.—*R. W. Giles.*

The Captive Dolphin.

The whale which was found by a fisherman in Selsea Bay some six weeks since, and presented to the Brighton Aquarium, is, says *Nature*, a valuable addition to that establishment. Although undoubtedly belonging to the whale family, competent authorities have pronounced it to be a bottle-nosed dolphin, a creature rarely to be seen alive in an aquarium. It has been placed in a tank which holds 100,000 gallons of water, and is 110 feet in length, so that the animal, which is ten feet long, has some amount of freedom. It seems to be doing quite well, for not only has it not lost in bulk since its capture, but has even gained, weighing now more than eight hundredweight. It is very tame, taking its food from the attendant. At present it subsists upon mackerel, that being the food most easily obtained just now. Of these it takes five meals each day, and manages to eat some four hundred of them during a week. The mackerel season is, however, almost over, and some other diet must be found for the animal, perhaps herrings. When first placed in the tank, it retreated to one end. After a week's sojourn there, it sought the other end of the tank. Here it remains swimming in circles. When swimming it keeps close to the surface of the water, moving through it with a graceful undulating movement, coming now and again to the surface, and taking in a fresh supply of air about every third or fourth time it thus rises. The animal is certainly an interesting acquisition to the aquarium.

Substitute for Rubber.

A composition has been invented by MM. Dankworth and Landers, of St. Petersburg, which is reported to be tough, elastic, waterproof, insulating—in short, a nearly sufficient substitute for India rubber. It is composed of a mixture of wood and coal tar, linseed oil, ozokerite, spermaceti, and sulphur, which are thoroughly mixed and heated for a long time in large vessels by means of superheated steam.

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Dowel Making and Doweling.

The method of putting things together by means of dowels, or doweling, as it is termed, is one of the utmost importance, and is required in some part or other of nearly all articles of furniture. I shall describe, first, the manner of making them, and then give a few directions for their use.

For making dowels you must select a *strong* and *tough* wood. The best for the purpose is *beech*, although oak or walnut will answer very well for some purposes; it must be *straight* grained, as straight as you can possibly obtain it, and *thoroughly dry*. The dowels are made in various sizes; those most generally in use are ⅛ in., ¼ in., ⅜ in., and ½ in. in diameter, according to requirements, a size very nearly ¼ in. diameter (about that of an ordinary lead pencil) being very useful. You must purchase or make a dowel plate. They are sold with holes in them for making three or four different sizes, but it is not a very difficult matter to make one out of a piece of iron ⅛ inch or so thick by punching a hole in it, and enlarging it to the size you require. You will want a brace and the necessary bits to correspond with the plate holes; now mark your wood out; about 10 in. or 11 in. lengths are the most handy to work, and the widths should be rather more than the diameter you intend the dowel to be.

Having cut out the lengths, plane them up *square*, then take off *each corner* of the square with the plane, so as to get them to correspond nearly with the holes. The best way to do this, which is rather an awkward job, is the following: Get a piece of pine ¾ in. thick, 2½ or 3 in. wide, and about 2 in. longer than your dowel lengths; straighten one edge of it, and mark a ¼ in. margin each side upon it; from this cut inwardly on the *bevel* to a depth of ¼ or ⅜ in. This will give you a V-shaped groove. You may cut it out throughout its length, and put a screw or pin in one end to form a stop; but it is better to leave ½ in. *square* at one end, and to cut the groove the remainder of length. This placed in the bench screw, and you will find your length will lie in it while you plane off the corners; you can then reverse and proceed until all are completed. It is necessary to take a *little more*—about two or three shavings—off *one corner*, it is immaterial which, than off the remainder.

I shall explain the reason for this presently. Having done this, take the dowel plate. You will notice that the holes on one side of it are larger around the apertures than the other; rest it with this side upward, upon the bench over a hole, underneath the one you intend using, and drive the lengths *steadily* through. You must commence carefully, holding the length with the left hand *near* the *bottom*, while you tap it *gently* with the hammer with the right until you get it fairly entered. Then go on more firmly. When you have driven it through rather more than the thickness of the bench, you will find it better to hold the length from the *underneath* side, as this will prevent the plate from jarring. The lengths should not go through without a *moderate* amount of driving force, and on the other hand they must not require *too much*, or they will be likely to break without going through. A little practice will familiarize you with this; but it is better at first to use your lengths a little shorter than I have previously recommended, and you will be less likely to break them. You must take care to keep them as *upright* as possible, and hit them fairly on the top. When made, they should, when looked at endways, or in section anywhere, be circular in appearance, and fit the plate hole tightly *with the exception of that portion where the additional amount was taken off the square corner, which should now appear a trifle off.*

Before doweling anything, it is necessary that the various parts intended to be secured by this method should first be fitted *exactly* in the position they are to ultimately remain in. Suppose, for example, we have the head of a desk, the top of a cabinet, or anything of a similar nature we wish to dowel. It is first accurately fitted and placed in position. Now, take a marking awl and mark lightly—a small mark ⅛ in. long is sufficient—*on the outside edge of the carcass*, one or two or as many points as you require dowels. You must, of course, be guided by the requirements of your work; a distance of from 4 in. to 6. in apart answers generally very well; but use sufficient to make it *quite secure.* When marking these points on the carcass, mark the top to correspond at the same time, by simply drawing the awl *upward* and marking it on its *underneath side*, taking care that it does not *move or shift* at all while marking. Then *gauge* on each, setting the gauge so that it will mark in such a position that you can bore with safety, not *too near the edge* or where there is any likelihood of *splitting* anything. From the previous markings draw a line at *right angles* to the gauged mark until it *meets* it. This is done by running a square along it. The points where these *two lines meet* will be those for the center of the dowel and its corresponding hole. In some cases, you will easily be able to find examples. We can obtain the position in this way:

Take the piece of work to be doweled, and consider the most suitable place for them. Mark this, and bore a hole in it with a fine bradawl; now, get a needle point, or a tack with the head knocked off, insert it in this hole, and give it a gentle tap; carefully press it home, and it will mark the required spot. This method is more applicable where some part of the work acts as a support to the other, and you merely want a dowel or so to steady it; like a piece of carving or fretwork. Our points being now all marked, bore the holes with a centerbit the size of dowel you intend using. Do not use them *too large.* If you are doweling into ¾ in. or 1 in. stuff, use *edgeways.* A ¼ in. or ⅜ in. is *quite large enough.* If you have not one the *same* size, use a *smaller.* You can then enlarge this with a *quillbit*, and remove the core produced by boring with a *nosebit.* Bore them *perfectly upright.* The depth will vary, according to circumstances, from ⅜ in. to 1 in. In some cases, it is immaterial how deep you bore; in others, this must be carefully attended to, because a hole bored right through might disfigure your work.

It is best to drive the dowels *first* into that part of the work where you *can bore deepest.* You must glue the *holes* well with good, hot glue. You will find a piece of iron wire very useful for this, and it can be used repeatedly, as the dried glue left on it after using will not adhere to the metallic surface. Now take your *dowel length*, and drive it into the hole, until it is home, and will go no further. You will notice while driving in, that the glue and air will escape from that portion of the hole where the dowel, as previously described, *does not quite fit.* If this were not so, the driving force necessary would, in all probability, split the wood around. You must saw the lengths off now, leaving sufficient to fill the other holes you have bored. If you cannot judge the requisite length sufficiently accurate with your eye, measure it, and do not get them *too long.* After sawing off, remove all the edges and *round* the top of the dowel with a rasp. It is best just to try that the holes are right, and the work in right position, by knocking it on temporarily. If so, glue the *holes* and put the parts together, press them firmly down to each other, and get a close join. If you have any difficulty in this, it is better to apply *gentle pressure* by using a hand screw or cramp to *force them together* than to *strike them* with a hammer or anything.—*Building News.*

The Wrinkling Strain of Pillars.

It is not often that pillars are made of thin plate iron; but as the failure of pillars of this kind is analogous to that of plate girders, the student of construction may profitably consider the question of wrinkling strain. A plate iron pillar may fail in one of three ways: (1) by crushing, (2) by flexure, and (3) by wrinkling, each of these modes being governed by laws peculiar to itself. It is seldom that a pillar fails by crushing, as it is generally made of a proportion in which simple compression does not come into play. More generally a pillar yields by both bending and crushing, but in plate iron pillars failure may take place first by wrinkling or corrugation. A pillar made of wrought iron plates of a size that would prevent failure by flexure ought to have the plates of sufficient thickness to prevent wrinkling. Let us imagine a stanchion of [section formed by plates. It is readily conceived that the unsupported edges would wrinkle. It is found by experiment that the edges of such a section would fail by wrinkling unless the distance of the unsupported edges is small.

Mr. T. Box, in his treatise on "Strength of Materials," illustrates this strain by an example of a rectangular pillar of thin wrought iron plates both ends flat, 8·1 inches × 4·1 inches external dimensions, with a thickness of 0·061, and a length of 2⅓ feet. By calculation, this pillar would fail with 1,173 tons, or 766 tons per square inch. But the absolute crushing weight of wrought iron in pillars is only 19 tons per square inch, or one-fortieth of the theoretical breaking weight by flexure. Even this reduced strain was not borne by the pillar, as it actually failed by wrinkling with 7·108 tons per square inch, or little more than one-third of the crushing strain; the ratios of the strains being, by wrinkling 1·0, by crushing 2·7, and by flexure 108. The actual breaking load in this case was only $\frac{1}{108}$ of the bending strength. By increasing the length of the pillar, flexure may become the principal source of weakness, its resistance to that being so reduced until it became less than the wrinkling strain. It often happens in practice that a pillar gives way partly by flexure and partly by wrinkling—a mixed result being obtained. Thus, in studying the laws of wrinkling strain, the experiments are made on short pillars, where flexure cannot come into play.

Mr. Hodgkinson's experiments may be expressed by the following rule for the compressive strain in tons per square inch, with which the plate will wrinkle: $W = \sqrt{t + b} \times M$, where W = the compressive strain in tons per square inch, t = the thickness of the plate in inches, and b the breadth in inches of a plate supported at both edges, as in a square pillar; M = the multiple found from experiment, the mean value of which is 80 for rectangular pillars. In a pillar of this kind the plates would be joined at the corners by angle irons, then the breadth is measured between the edges of the angle pieces. Hodgkinson's experiments have clearly demonstrated that the wrinkling strain is independent of the length of plate. Experience has also shown that in long plate pillars the plate often fails near the end. As Mr. Box observes, the crushing strain due to flexure is a maximum at the center, and at the ends it is *nil*; but the crushing strain of direct pressure is the same from end to end.

The best plan of strengthening plate iron against wrinkling is by the addition of angle irons or ribs, which practically reduce the breadth of plate. A center rib, for instance, reduces the width to half, and the wrinkling strain is decreased 41 per cent. Indeed, the object in all structures composed of thin plate iron, like pillars and beams, is to reduce the practical breadth of the unsupported plate by cellular arrangements, by ribs, or otherwise, such that the wrinkling strain shall be made equal to the crushing strain, or 19 tons per square inch. Those who wish to study the subject of wrinkling strain will find it handled in a masterly and exhaustive manner in Mr. Box's treatise. Thin plate-iron pillars are seldom used by the architect; but the engineer resorts to them in the piers of bridges and other purposes, and he will find the addition of angle iron stiffeners increase the strength in a direct ratio.—*Building News.*

New Rules for the Shipment of Explosives.

Commissioner J. W. Midgley has issued the following circular, under date of July 21, for the use of the railroads in the Southwestern Railroad Association, Iowa Trunk Line Association, and Colorado Traffic Association:

Shipments of Hercules powder, Atlas powder, giant powder, and other explosives of which nitro-glycerine forms the basis, when subject to the above associations, except California, will hereafter be transported on the following conditions and at the following classification:

1. That, at the cost of shippers, the bottom of the car containing the above mentioned explosives must be covered to the depth of at least two inches with sawdust, to absorb possible leakage.

2. That the packages containing the explosives shall be so placed and loaded that the cartridges shall always lie on their sides and not on their ends.

3. That the cars shall be so marked, on both sides and ends, that those who will have charge of them will not do anything ignorantly to incur danger.

4. In less than car loads, this property will be received (when made into cartridges only, and not in bulk under any circumstances) on the following conditions:

Packed in wooden cases, in cartridges, each case not exceeding 100 pounds, nor less than 5 pounds of explosives, provided that such explosives are packed in dry sawdust, as follows:

Each cartridge shall be surrounded on all sides with dry sawdust, and all interstices between such cartridges and a space of at least one inch between the outer side of such cartridge and the inner side of the case shall be filled with dry sawdust. Each of these cases shall be plainly marked on at least three of its sides with the name of its contents and "Explosives—Dangerous," so as to be readily seen by those who are to handle it.

5. In no case must the caps, fuse, or exploders used for exploding these powders be loaded in the same car with the explosives, and under no circumstances will the cars be received if so loaded.

6. Any and all nitrate or other explosive preparations not in accordance with such specifications (except ordinary black powder) will in no case be received for shipment.

7. All loss or damage to such property that may result from explosion or from a disregard of any of the above conditions by shippers or by the agents of the lines comprised in the above associations must be assumed by the shipper or owner.

8. Under the above conditions, the rates will be: In quantities less than car loads, actual weight, twice first class; in car loads, actual weight, minimum 20,000 pounds per car, first class. No shipment will be rated at less than 100 pounds.

The right of any of the railroad companies comprised in the above associations to refuse to receive high explosives for transportation under any circumstances is reserved.

This circular is a most important one, as heretofore high explosives were not mentioned in the tariffs of these associations, being accepted by the different lines at special rates.

Mexican Railroads.

The *Mexican Financier* gives the following list from official sources of the railroads completed in Mexico up to the end of April:

	Miles.	
Tlascala Railroad	2·57	
Orizaba-Ingenio	3·00	
Mitla	3·75	
San Andres	7·00	
Tlalmanalco	9·00	
Puebla and Matamoras Izucar	19·00	
San Martin	23·00	
Tehuacan-Esperanza	31·00	
Tehuantepec	31·00	
Sinaloa and Durango	36·00	
Vera Cruz-Medellin	39·00	
Hidalgo Railroad	56·00	
Puebla-San Marcos	57·00	
Yucatan lines	68·00	
Mexico-Tlalputalpam	75·00	
Sonora Railway, Guaymas to Nogales	234·00	
Interoceanic, Mexico to Cuantla and branches	183·00	
Mexican National, Mexico to Acambaro	178·00	
Laredo southward	208·00	
Branches	87·00	
		473·00
Mexican Central, Mexico to Lagos	311·00	
Paso del Norte to Chihuahua	302·00	
Tampico to San Luis Potosi	62·50	
		675·50
Mexican Railway, Vera Cruz to Mexico	264·00	
Puebla and Jalapa branches	89·50	
		353·50
Total		2,379.25

The table foots 2,379¼ miles, although the *Financier* gives the total completed road at 2,437 miles. The Mexican National, the Interoceanic, the Hildago, and the Yucatan lines are narrow gauge, the rest standard gauge. A number of the shorter lines given above are worked by horse power, and some of them have been in existence a long time.

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Hydrokinone, a New Developer for Gelatine Plates.

BY EDWIN BANKS.

Hydroquinone, or hydrokinone, or quinol—for it is known by all these names—partakes very much of the nature of and is closely allied to pyrogallol. Like pyrogallol, it is a derivative of benzine. The solution of it is neutral to litmus paper. It has a powerful attraction for oxygen, absorbing it when dissolved in water from the atmosphere, and more rapidly when rendered alkaline, though in neither case does it do so as rapidly as pyro; hence its solution will keep better, and, when mixed with alkali, retain its developing power a longer time than pyro. The chemical formula is also very similar. Pyrogallol has $C_6H_3(OH)_3$, and quinol $C_6H_4(OH)_2$; so that, it will be observed, while each contains six atoms of carbon and six atoms of hydrogen, which is the composition of benzine, pyrogallic contains three atoms of oxygen and quinol only two. Another resemblance to pyro consists in the fact that both exist in nature in certain vegetable productions; pyro exists as gallic acid in gall-nuts and oak bark, and quinol as arbutive in the leaves of the arbutus, or berberry, and other *Ericaceæ*.

Commercially, quinol is made from aniline and from car bolic acid, both also benzine derivatives. It is first obtained as quinone ($C_6H_4O_2$) by the oxidation of aniline. One part of aniline is dissolved in eight parts of sulphuric acid diluted with twice its bulk of water. After cooling, a saturated solution of two and a half parts of bichromate of potassium is added very gradually to avoid too great rise in temperatnre. At first a thick, pulpy mass of aniline black is formed, the reaction being the same as that which takes place in the aniline printing process. This shortly changes to a dirty brown solution. It is then treated with sulphurous acid in excess, when quinol or hydrokinone is formed. This is extracted from a solution by ether, and on evaporation crude quinol is left. Other methods are given, but sufficient has been said to give an idea of its nature. Its characteristics as a developer are of the most interest to photographers.

Captain Abney, who, I believe, was the first in this country to draw attention to its developing power, says that it is twice as powerful as pyro. It is very certain that it will bring out a fully developed picture with at least half the exposure necessary when pyro is employed. At first sight this appears strange when it is observed how much more powerfully pyro absorbs oxygen; but the explanation probably is in the fact that hydrokinone is more gradual in its action, and has a more "selective" power than pyro. With a collodio-bromide film, for instance, which is not so much protected from chemical action as a gelatine one, pyrogallic acts with such energy, when mixed with an alkali, that the whole film is reduced immediately, and no image, or only a faint one enveloped in fog, appears; hence there must be used a powerful restrainer to keep this action within bounds. A soluble bromide, which is usually used, has this effect, but, unfortunately, at the same time, partially undoes the work which the light has done, rendering it necessary to give longer exposure. But with hydrokinone no restrainer is necessary unless a great error in exposure has been made. It does its work rapidly and clean, in this resembling the ferrous oxalate; it does not discolor during development so much as pyro, and consequently does not stain the film so much, while full printing vigor is very easily obtained without having to resort to intensification. The color and general appearance of the negative are more like the wet-plate process, since the shadows remain so clear and free from fog. It seems almost impossible to fog a plate with it.

A collodio-bromide, or even a collodio-chloride, plate exposed in the camera will develop clean and rapidly without any restrainer. This property of developing a chloride is very surprising, and will probably be very important. I have tried a collodion containing all chloride, with no trace of iodide or bromide or of free silver, and in the camera it is nearly, if not quite, as rapid as a bromide when developed with hydrokinone and an alkali; while I think it has the advantage in roundness and vigor. One grain to the ounce is strong enough for most purposes. With some samples of hard gelatine it is advisable to use two; but with most kinds and with collodion one grain is quite sufficient. I prefer using it with a saturated solution of washing soda as an alkali. Two or three drops of this to the ounce of solution of hydrokinone rapidly develops the image, and the addition of a few drops more to complete development is all that is needed. A soluble bromide acts very powerfully as a retarder and restrainer. With a mere trace added, development is very much slower.

Although its cost per ounce is greater than pyro, an ounce of it will go as far as two of pyro, so the difference is not so much as it appears. No doubt, if a demand sprang up for it the price would also be reduced considerably. Many of you, I dare say, can remember the time when pyro was seven shillings and sixpence per ounce, and hypo two shillings per pound; but greater consumption, and consequent demand for them, soon brought these prices down. The same will doubtless take place when the value of hydrokinone becomes recognized.

I must not omit to mention, before concluding, another useful property of this developer—that is, its suitability for developing on paper either a bromide or a chloride film, whether it be produced by an emulsion, or by the older method of first brushing over the paper the haloid, and afterward the silver. The clearness with which it works renders it very suitable for this purpose, and for enlargement or printing enables pictures to be obtained with very short exposures.

Steel in its Relation to Modern Guns.

At a recent meeting of a number of artillery and naval officers at Karlsborg, Sweden, Captain John Bratt, of the Swedish artillery, read a paper on "The Steel Industry and its Relation to the Manufacture of Modern Guns." The author has for many years been the government inspector of Swedish gun factories, and has paid many visits to the gun factories of Russia, Germany, and France. In his paper, having given an account of the importance of iron in modern civilization, the author stated that there was no other raw material which had been subjected to such a successful process of refining.

It was in its most important and interesting form, viz., steel, that he intended to deal with it on this occasion.

Captain Bratt proceeded to show, by drawings and diagrams, the metallurgical processes and methods of refining in use at the present moment. Having referred to the various kinds of steel and their manufacture, the author urged the necessity of subjecting all cast steel, of whatever kind, to a mechanical process of treatment by which the cavities which are caused by the gases contained in every steel bath are entirely removed. The steel, he said, should be perfectly close and homogeneous in order to be suitable for manufacture.

The means of obtaining this indispensable quality was the steam hammer. The largest at present in use were those at Le Creusot, Essen, and Perm (Russia). The latter rested on the largest block of cast iron in the world. It had a cubic contents of 83 cubic meters, and contained 700 tons of pig-iron. The difficulties, the cost, and, in some instances, the danger of forging great blocks of steel made it a matter of moment to discover some method whereby the gases in the bath might be removed and a homogeneous steel produced.

Such a method was discovered in 1870, and had been perfected at Terre-Noire, and consisted chiefly in adding a flux of silicon in the Martin furnace immediately before the steel is tapped. The author showed some samples of steel made at Bofors, in Sweden, by that method. One was taken from the hearth immediately before, and the other just after, the silicon was added. The former had a surface similar to a fracture, and was covered with blisters, whereas that of the latter was perfectly smooth. The Bofors Iron-works were the first Swedish works which had procured the Terra-Noire patent, and thus the first producers of this kind of steel in Sweden; and the method had a special interest to those assembled by the fact that guns of Bofors steel had been manufactured with the most satisfactory result, which led him to believe that Sweden would very soon make her own guns.

The author next gave an account of Krupp's manufacture of forged steel guns. The Essen works had in 1848 employed 72 men; in 1882 their number was 16,000, while some years ago they had in five months turned out no less than 1,400 pieces of artillery. In twenty-four hours the works could roll sufficient rails for a Swedish mile of railway (six English miles). Captain Bratt then referred to his personal study of the Krupp method. He had been present at the casting of guns at the foundry which had been established by Messrs. Krupp near St. Petersburg. He stated that the ingots for some of the largest guns numbered up to 500.

He then described the heating of the metal for forging, and the difficulties attending this operation, the forging under the steam hammer, whereby the cast metal is compressed to under four times its original size, and, finally, how the gun, after being bored and turned, is made red-hot and hardened in oil. The author next gave an account of the experiments which had during the last few years been made in Sweden, to solve the question of producing first-class guns of close cast steel by the Terre-Noire method.

The trials made included the bursting of a smooth-bore 4-lb. muzzle loading gun. It had shown a very high degree of resistance, and had, in fact, only been burst by loading it right up to the muzzle. No less than 1,041 shots had been fired from a 12-centimeter rifled breech-loader, which was at last burst under the excessive pressure in the chamber of 5,500 atmospheres, while the normal one was from 2,000 to 2,100. The last experiment was the firing of three 8-centimeter guns of the new model gun of the Swedish artillery. Each of these guns had, without suffering in the least degree, fired 2,000 shots, with normal charges.

Two of them were then, after 152 and 154 attempts had been made, burst, under a pressure in the chamber of 5,000 atmospheres, the normal one being 1,800. The third gun could not be burst, but only cracked in the breech. All these guns had been cast at Bofors, and were finished at the gun factory at Finspong. In conclusion, Captain Bratt stated that lately a competition had sprung up between these two works, which had before worked in concord. This was caused by the fact that the problem whether first-rate steel guns could be made in Sweden had been solved, and that these two works desired in future to be independent of each other in gun making. At Bofors there was now erecting the plant required for finishing guns, and at Finspong a steel foundry. Both had received orders from the government, and he trusted that at no distant date they would receive them also from foreign governments.

PHYSICIANS say that ginger ale is a poor substitute for water, because the capsicum it contains irritates the lining of the stomach and produces dangerous inflammation.

The Pollution of Streams.

Possibly the matter will, some time, attain importance enough to question the present assumption of municipal and other corporations of the right to use any flowing stream as an open air sewer. In Hartford, Conn., this aspect of the question has assumed a serious character. A stream called Park River, an affluent of the Connecticut River, receives the principal portion of the sewage of the city of New Britain, the sewage of not less than ten manufactories within the limits of Hartford, and then courses the boundaries of the Bushnell Park, on which stands the Capitol, receiving in its course around the park the emptyings of several of the principal sewers of the city. The result is an open sewer of the vilest description in the heart of the city. In the light of the common law and of recent decisions on this subject, it is possible that a suit by any individual citizen might not lie against the city as a corporation for permitting the befoulment of the stream to the annoyance of passengers on the streets and visitors to the park.

A case was recently tried in the Supreme Court of New York, in which the plaintiff sued the city of Rochester for damage to him by reason of sewage poured into a stream that flowed through his land, the water being used for his cattle. The court gave him a verdict for damages. The judge decided that the plaintiff has a right to say that nobody shall increase the natural flow, nor can he be compelled to take any more drainage than flows by reason of the natural shape of the land, nor can the people above him turn anything into the stream which would not naturally flow there if left to its ordinary course. They cannot increase the area drained, the amount of the drainage, or send down into the stream any waters or things that would not naturally flow there.

The *Sanitary Engineer*, in summing up the common law on this subject, makes these points from authorities:

"The fact that the water of a stream has been polluted in a similar way for more than twenty years, does not confer a prescriptive right to continue it, particularly when the nuisance results from the *increase* of the pollution. The fact that a town has legislative authority to dispose of its sewage does not give it the right to discharge that sewage into a stream adapted for domestic use.

"The fact that a person owning property on the banks of a stream, and thereby owning an interest in the water, does not use the water for domestic purposes and has no desire to so use it, does not prevent him from bringing an action to protect himself against the acquirement by others of a prescriptive right to pollute the stream, and thereby depriving him of his right to receive the water unimpaired either in quality or quantity. The English precedents forbidding the contamination of streams by sewage are very numerous, and take the ground that the fact that the preservation of the health of a large city requires the removal of its sewage, and that this cannot be done except at great expense without discharging it into a stream, does not justify such discharge if there are even but a very few persons to be affected by the nuisance thus created. The city must either buy the rights of these few persons or compensate them for their violation."

Artesian Wells in Algeria.

In the south of the province of Constantine, Algeria, the boring of artesian wells, begun in 1856, was continued with renewed activity, after the interruption occasioned by the Franco-Prussian war, under the direction of M. Jus. At the end of 1879 the long line of wells following the Wady Rir, between Biskra and Tugurt, included 434 sunk by the Arabs, and yielding 64 000 liters a minute, and 68 bored by the French, yielding 113,000 liters. In the same decade, the number of palm trees in the oases had increased from 359,000 to 517,000; of fruit trees, from 40,000 to 90,000; of inhabitants, from 6,672 to 12,827. During the first half of 1880 twelve new wells were bored, yielding 22,000 liters, and, at the end of 1881, the total supply of water from these underground sources was 209,000 liters a minute.—*Rev. Geogr.*

A Bushel of Coal.

In consequence of the practice of peddlers of coal in Boston of selling by means of short measure, getting retail price for three pecks of coal for a nominal bushel, a law has been passed specifying that in the sale by measure of coal in quantities less than five hundred pounds, the baskets or measures used shall be of a cylindrical form, of the following dimensions: nineteen inches in diameter in every part, and nine inches in depth, measured from the highest part of the bottom, each of which shall be deemed to be of the capacity of one bushel; or nineteen inches in diameter in every part, and four inches and one-half in depth, measured from the highest part of the bottom, each of which shall be deemed to be of the capacity of one-half bushel. Such measures, in selling, shall be filled level full, and shall be sealed by a sealer of the city or town in which the person using the same usually resides or does business.

Artificial Filtering Stone.

K. Steinman, in *Tiefenfurt bei Goritz*, proposes filtering plates from the following mixture:

Clay	10 parts	or 10	or 15
Levigated chalk	1	1	1
Glass sand, coarse	55	..	.
" fine	..	25	65
Ground flint	..	30	5

The ingredients are mixed thoroughly in water, moulded, and hard burnt.—*Dingler's Journal.*

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ENGINEERING INVENTIONS.

An improved steam motor boiler, in which steam is generated by employing a large proportionate heating surface, has been patented by Mr. Josef Schreiber, of Vienna, Austria. A series of tubes depend from the bottom of the boiler into the furnace, and within these are suspended smaller circulating tubes. The object of the series of tubes is to produce superheated dry steam.

An improvement relating to refrigerator cars has been patented by Mr. Charles P. Jackson, of Chicago, Ill. An ice chamber extends the whole length of the car. An inside partition extends all around the car, which serves to prevent the passage of the hot air from without and the cold air from within. The ice rests upon supports at the top of the car. These supports may be raised or lowered to admit of a greater or less quantity of ice for lowering or increasing temperature. Pans are provided for receiving the drip from the melting ice.

An improved traction engine, which is claimed to be lighter and to have its weight and strain more equally distributed upon the supporting wheels than any previously constructed, has been patented by Mr. L. E. Bandelier, of New Haven, Ind. In this machine all four of the wheels are made to act as drivers, and any one of them may be driven by itself independently of the others, to facilitate turning. The invention relates also to improved construction of the wheels, which are provided with radial spokes, and with oblique and angular thrust braces, which it is claimed greatly increase their strength.

An improvement relating to balanced slide valves for admitting steam to the cylinder of steam engines, has been patented by Mr. James B. Allfree, of Cumberland, Md. The object of the invention is to prevent the thump consequent upon the sudden shutting off of the steam. The improved valve is provided with two valve seats placed parallel with one another, and having two other valves arranged to reciprocate thereon and held together by clamps at the ends, which fix the limit of separation. Springs are provided which retain the valves in proper relation to one another, to permit their approach to each other when unduly pressed.

An ingenious device for opening up snow banks to permit the passage of trains has been patented by Mr. G. A. Gunther, of New Utrecht, N. Y. The locomotive is provided with a long tube, one end of which terminates within the caboose, while the other projects in front of the locomotive. The locomotive is likewise furnished with a snow plow, and when this is insufficient for clearing away the snow a torpedo is inserted in the tube, which is exploded by coming in contact with an anvil at the end of the tube, thereby scattering and loosening the drift for the more ready entrance of the plow. The same inventor has also obtained a patent for another powerful device for clearing away snow on a railroad track. The invention consists in a cannon for loosening the snow, which cannon is preferably provided with side apertures or tubular arms which serve to loosen up the snow in front of the plow for facilitating the action of the latter. The same inventor has also obtained a patent for still another form of device for exploding torpedoes in snowbanks. Upon a car suitably arranged for the purpose, is raised a tower having a shaft projecting horizontally from its top. The torpedo is run out on this shaft to its extremity, and then dropped into the snow bank, where it is exploded by jerking the rope which regulated the descent of the torpedo into the snow bank. The car is likewise provided with a plow for clearing the track when the snow has been loosened by the explosion.

MECHANICAL INVENTIONS.

A very simple and inexpensive hand press has been patented by Mr. Thomas L. Vought, of Madelia, Minn. The especial object of the improved press is to facilitate the compression of corn stalks, straw, hay, and other combustible substances into bundles for fuel.

Mr. John J. Myers, of Baltimore, Md., has obtained a patent for an improved dry gas meter, in which the stop plates are so constructed that it is impossible to pass a wire down the inlet passage and tamper with the works. With this meter persons with dishonest intent are prevented from disturbing the flow of gas, or its registry.

A very simple meat chopper, an improvement upon a patent granted to same inventor July 4, 1882, has been patented by Mr. Adam Metz, of Burlington, Iowa. The improvement consists in suspending from the rocking lever a series of segmental knives, by which means the meat is more quickly chopped, and at the same time more effective work is claimed to be accomplished than with most other meat choppers.

Mr. George W. Converse, of Spokane Falls, Washington Ter., has obtained a patent for an improvement in turbine water wheels of that class in which the water descends in an annulus through chutes which cause it to project obliquely against the sides of the bucket, on which it acts both by its impact and its weight, escaping from the bottom of the wheel in an annular stream.

An improved mill in which the grain or other substances are crushed between rollers has been patented by Mr. James B. Allfree, of Cumberland, Md. This machine is provided with two permanent rollers and with two revolving rollers, which are provided with springs, so that when any hard substance is encountered, the rollers will yield and save the mill from breakage.

A very simple washing machine has recently been patented which consists in a box having a semi-cylindrical battened bottom, and a dasher provided with projecting teeth which is so mounted on the box of the machine that either a pounding motion or a lateral to and fro rubbing motion is brought to bear on the clothes. The inventor is Mr. L. N. Myers, of Middleburg, Pa.

An improved sewing machine shuttle has been patented by Elizabeth Chavers, of Siddon, Mich., which consists in a shuttle containing a spool of thread or silk, which spool is mounted on a spindle in the shuttle, the thread passing through an aperture in the shuttle through a U-shaped slot in a blade pivoted on the shuttle, and then through the opening in the sewing plate of the machine.

Mr. Samuel N. Silver, of Auburn, Maine, has recently patented a very simple spring motor intended for propelling sewing machines, bicycles, and like purposes where small power is required. By the use of a spring connected to the driving shaft, and the adaptation of clutches, the inventor has produced a very simple motor and one for which he claims considerable merit.

Mr. Edgar T. Gordon, of New York city, is the patentee of an improved method of manufacturing turning lathes for light work. This consists in preparing the wearing portions of steel or iron, and completing the structure by casting the metal in and around these parts. This avoids all labor of tapping, drilling, keying, etc., and enables a very good machine to be made at little cost.

A simple but practical device to prevent doors from rattling has been patented by Mr. John Milton, of Hamilton, Va. This improvement is designed to be attached to the ordinary latch of a door, and consists in an accessory latch operated by the knob and simultaneously with the ordinary latch, and so connected with it that when the door is closed this latch will press against the keeper, and thus close the door firmly and prevent rattling by the wind.

Mr. James Hobson, of Bury, near Manchester, England, has obtained a patent for an improved pile wire motion for looms used for weaving carpets, velvets, plush, etc. A stationary track is provided upon which slides the carriage for inserting the pile wires into the fabric, and this is further provided with an oscillating switch pivoted to the outer end of the track in such manner that it shall be capable of movement to and from the carriage track to receive and properly transfer a newly withdrawn pile wire for re-entrance into the fabric.

Mr. Geo. W. Wilson, of Lanesborough, Minn., is the patentee of a very simple separator and purifier for grain, meal, etc. This machine is provided with a number of sieves which are set in a frame, and shaken by the rocker that is mounted upon a rotary shaft, the grain being delivered on to these sieves through a spout. In the space above these sieves is arranged a suction blower for carrying away the dust and chaff from the grain. Suitable slides are arranged for regulating the power of the blast, and the sieves are so arranged that they may be changed according to whether grain, fine middlings, or meal is to be purified.

An improved machine for cutting out and stamping crackers from sheets of dough has recently been patented. The dough is pressed out into a sheet by rollers, and is then delivered upon an endless apron which carries it beneath the stamps, and cutters. By pressing the dough before stamping the crackers are rendered of a more uniform diameter and appearance. The bed plate, which is located underneath the cutters to resist the pressure from the latter, is supported by rubber blocks upon a secondary plate, which is adjustable upon four screws, so that it may be regulated according to the thickness of the dough. The inventors are Messrs. D. H. Cornell, of Brooklyn, N. Y., and August Schincke, of New York city.

Among the recent inventions in treating ores, of which Mr. W. H. Howland, of San Francisco, Cal., has patented many, is a new machine for grinding and pulverizing ores. The ore is deposited in the present machine at the center, and when the driver is rotated the ore is thrown out by centrifugal force, and by rotating arms. In this way the fragments of ore are ground against one another and against the serrated surface of the internal wall of the mill, and become pulverized. Water is supplied to the mill for washing and separating the ore. In case the mechanical action is not sufficient for pulverizing the ore, steam is used for heating the water, which facilitates the grinding.

An improved instrument for measuring distances, called a geodometer, has been recently patented by Mr. Samuel Dewell, of River Sioux, Ind. A large wheel is journaled between two shafts and an odometer with dials and pointers is placed on the axle to record each revolution of the wheel, the rim of which is marked off into twenty-five equal parts, each division representing one link of a surveyor's chain. One of the several spokes in the wheel is painted a different color from the rest, so that every revolution of the wheel is observed, and the distance traveled recorded. A novel arrangement is attached for calculating the distance across streams, etc., where the machine cannot be propelled. With the geodometer an inexperienced person can take measurements, and determine numbers of acres without much calculation, the distance traveled being automatically recorded by the odometer.

AGRICULTURAL INVENTIONS.

A machine which combines the whole operation of harvesting and husking corn has been patented by Mr. William H. Secor, of Farragut, Iowa. This machine is designed to be driven over the row of corn, and the ears are stripped from the stalks as the machine passes along, by radial wings, which are connected with a rotating shaft. The ears are then carried by an endless apron to the rollers located in the back part of the machine, which rollers strip the husk from off the ear and deposit the latter in a receiver.

An improved draught equalizer hae been patented by Mr. Elmer E. Stevenson, of Quincy, Minn. This is adapted especially to be applied to harvesting machines, and consists in a bar secured transversely to the tongue of the machine and having two oscillatory metal triangles at the ends pivoted to the bar. A chain passes around a pulley connecting the triangle draught attachment in such a way that the draught is equalized, so that a less powerful animal does only the work relative to his strength.

MISCELLANEOUS INVENTIONS.

Mr. Frank A. Buell, of Brooklyn, N. Y., has patented an improved saw handle. The object of the invention being to avoid any cramping of the fingers, and to enable the operator to grasp the handle more firmly than is possible with the ordinary hand saw handle.

Mr. Charles H. Niggeman, of Lexington, Mich., is the patentee of an improved stud button, in which two heads are connected together by a cylindrical shank within which is a spiral spring. One of the heads is detached from the shank to admit the latter being attached to the shirt, and then so firmly secured again as to render it impossible to become detached.

For forming dove-tailed mortises in the front of drawers, and like purposes, the Eagle Lock Company, of Terryville, Conn., have by assignment from Mr. W. D. Bradt, of Jackson, Mich., just had a patent granted to them for an improved router bit. By this implement locks are made to fit in cupboard and other doors without screws, as well as bureau drawers without screws.

Mr. P. J. Leonard de Rache, of New York city, is the patentee of an improved fireproof ceiling. The ceiling is composed of tiles supported from the joists by hangers, and having facing tiles placed against the sides of the joists, and top tiles placed between the upper parts of the joists. The top tiles and the tops of the joists are covered by a layer of cement, rendering the ceiling secure against fire.

An improved manner of balancing two wheeled vehicles has been patented by Messrs. John W. Coe and Daniel Merritt, of Brooklyn, N. Y. The body is hinged at its forward end to the crossbar of the shafts, and connected at its rear ends with springs which rest upon adjustable supports attached to the shafts in the rear of the crossbar, so that by simply turning the set screws of the crossbar the cart body will be raised or lowered at the rear, to balance the cart properly for persons of different weights or horses of different size.

An improved sash holder, for holding and locking a sash in any desired position, is the subject of a patent granted to Mr. William Conner, of Missouri Valley, Iowa. Within the window casing is placed a wedge-shaped piece to which is attached a link movement. A handle is placed inside the room connecting with the link attachment. By operating this handle the wedge is brought more or less forcibly against the edge of the sash, holding the window partially open or closed as desired.

An improved device for holding a door open against the wall of a room, and which serves likewise as a buffer, has been patented by Messrs. G. G. Matthews and Rudolph Matthews, of Wichita, Kan. A beveled catch is attached to the lower edge of the door and a spring catch is fastened to the base board of the room, so that when the door is swung open the catch on the door hooks into the spring catch on the base board, holding the door ajar against the wall.

A machine for cleaning small fruit, such as currents, huckleberries, etc., has recently been patented by Mr. J. F. Hudson, of Brooklyn, N. Y. The fruit is deposited in a receiver whence it passes into a cylindrical screen composed of longitudinal wires and furnished with a brush which rotates concentrically within the screen. In this way the stems, dust, and other refuse pass through the wires and fall into a receiver below, while the berries are carried down and delivered into a box underneath the machine.

Mr. Alex. G. Points, of Staunton, Va., is the patentee of an improved dinner pail for the use of workmen and excursionists. The casing is cylindrical and provided with a series of circular pans placed one above the other within the outer case, they being designed for meats, eggs, or other foods. The opening at the top of the cylinder is closed by a tea kettle. A receptacle is formed at the end for carrying knives, forks, etc. Provision is made for carrying a tin cup on the tea kettle. The pail seems to be very compact and well arranged for the purpose for which it is intended.

Mr. Michael Hannan, of New York city, has obtained a patent for an improved snow melting apparatus intended to facilitate the removal of snow from streets. This consists in a tank open at the top, so that the snow may be readily shoveled into it. A cylindrical furnace is placed within the tank. The snow as it falls upon the heated wall over the furnace flues is immediately melted, and the water flowing into a reservoir may be used for clearing away any remaining snow upon the street, and in the gutter.

An improvement in blackboards used in schools for displaying examples in mathematics and similar purposes has been patented by Mr. Otis M. Mitchell, of Marathon, N. Y. It is so constructed that an example or copy may be exhibited in connection with the board, and at the same time the latter may be used as a desk, arrangement being made for swinging it from the wall, and lowering the upper portion to form a table or desk. A convenient table or desk for making drawings, etc., is thus improvised, when the article is not required for a blackboard.

Messrs. Silas B. Hazen and G. L. Van Gorder, of Winamac, Ind., have obtained a patent for a very simple device for holding a door open or in any position desired. This device is not permanently attached to the door or wall, but consists in a wedge-shaped strip of metal, or a spring wire frame may be used with like good results. When in use the metal strip or wire frame is laid upon the floor, and the door is swung over it and a latch prevents the door closing again, and the wedge-shape of the check prevents the door swinging further open, so that the door is held in any desired position by very simple means.

An invention which recommends itself to the attention of grocers is the patent of Mr. Addison M. Herman, of Newtonia, Mo., for an improved tilting barrel or bin. This improvement not only facilitates access to the contents of the barrel, but protects the contents against insects and dust. The barrel or bin is secured to bars which are mounted on pivots, the sockets of which are provided with annular recesses to hold a liquid for preventing the passage of insects into the barrel. To the rear ends of the tilting bars are hinged links fastened to the cover of the barrel or bin, so that when the barrel is tipped forward the lid will be simultaneously raised, affording ready access to the contents of the barrel.

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Lightning Screw Plates, Labor-saving Tools, p. 78.

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Drop Forgings. Billings & Spencer Co. See adv., p. 45.

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The Sweetland Chuck. See illus. adv., p. 46.

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Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 62.

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NEW BOOKS AND PUBLICATIONS.

DIE ELEKTRISCHE KRAFTUBERTRAGUNG (THE TRANSMISSION OF POWER BY ELECTRICITY). Edward Japing. Wien, Pest, Leipzig: A. Hartleben, 1883. 236 pages.

Various means have been devised for transmitting power, and the last is by the use of electricity. Mr. Eduard Japing has published a very interesting work, which is now before us, on the above subject. He first describes the natural and artificial powers adapted for operating the electric generators, the various kinds of machines for generating electricity, electromotors, their advantages and defects, the magneto-electric and dynamo-electric machines, and the relative costs of producing the current by means of machines, batteries, etc. The following chapters treat of the theory of converting the current into work, the theoretical calculation in relation to transmitting power great distances, the thickness of the transmitting wire, the effect of counter-currents, the effect of the number of revolutions of the armature, etc. The transmitting wires and cables, the insulation of the same, the division of the current, and the accumulators or storage batteries, especially those exhibited at Munich, are the subjects of the following chapters. The last chapters are devoted to the losses sustained by transmitting power, examples of practical use of the electric transmission of power, and the relative cost of such transmission. This work constitutes the second volume of Hartleben's Electro-Technical Library.

THE WATCHMAKER'S HAND BOOK. By Claudius Saunier. Translated and enlarged by Julien Tripplin and Edward Rigg, M.A. Illustrated by wood cuts and copper plates. Published by Julius Tripplin, and by A. Fischer, London.

This handy sized volume contains much that may be useful to other workers in the metals besides those engaged in watch making. The treatment of cast steel, brass, copper, and bronze, the contrivance of appliances for their working, the choice, use, and care of tools, and many handy shop hints, make the usefulness of the manual extend beyond the particular branch of mechanical art for which it is especially designed. For the watch maker and the watch repairer, the directions are so minute and exact and the illustrations so frequent that the book must be valuable for reference to workmen and useful as an instructor to apprentices and beginners.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) O. W. R. asks: What would be the weight of a body on the surface of the sun as compared with its weight on the surface of the earth? Scientists seem to vary largely in their estimates. Proctor says a letter weighing half an ounce on the earth would weigh about four tons on the sun, which is about in proportion to the mass of the sun as compared with the earth, taking into consideration the fact that the specific gravity of our luminary is only one-half that of the earth. Other writers place the weight of a body at the sun as only about 27 times as great as on the earth. Which is right? A. The sun's mass is about 354936 times that of the earth, and its radius is about 111·8 times that of the earth. Hence the difference of the masses divided by the square of the difference in their radii equals the difference in gravity at their surfaces, for the difference in gravity is inversely as the square of the radius. Thus $\frac{354{\cdot}936}{111{\cdot}8^2}=27{\cdot}9$; or a body at the sun's surfaces would weigh 27·9 times more than at the earth's surface, under the same conditions. But a body that is solid at the surface of the earth would be vaporized by the intense heat at the sun's surface, and its condition in regard to gravitating influence might be materially changed. We think that it would be somewhat less than the above figures. We think the quotation from Proctor an error, as he does not hold that view in his latest work.

(2) E. P.—The following is recommended as a good mucilage for labels: Marcerate 5 parts of good glue in 18 to 20 parts of water for a day, and to the liquid add 9 parts of rock candy and 3 parts of gum arabic. The mixture can be brushed upon paper while lukewarm; it keeps well, does not stick together, and when moistened adheres firmly to bottles. For the labels of soda or seltzer water bottles it is well to prepare a paste of good rye flour and glue, to which linseed oil, varnish, and turpentine have been added in the proportion of half an ounce of each to the pound. Labels prepared in the latter way do not fall off in damp cellars.

(3) J. M. B. writes: There is a difference of opinion here as to the power of two engines. One marine engine, 6 inches in its diameter, 6 inches stroke; one marine engine 6½ inches in its diameter, 8 inches stroke, 100 pounds steam. 28 inch two blade propeller. Which has the most power, and what is the difference, same number of revolutions? A. 6 inches by 8 inches stroke has 20 per cent more power than 6½ inches by 6 inches stroke.

(4) M. S. R. writes: Having an old Gregorian telescope, the brass tube of which is a little over 5 inches in diameter, that in its present state is of no use whatever, I would be glad if you could inform me in your Notes and Queries: 1. What should be the focal length of the plano-convex objective 5 inches diameter, in order to make a cheap achromatic telescope on the dialytic principle of about 5 feet focal length when finished? 2. What should be the focal length of the flint achromatizer? 3. Whether a single plano-concave will answer, or if a compound one, consisting of a plano-concave of flint and a plano-convex of crown glass, will be required? 4. Can the correction be made with an achromatizer of 2 inches in diameter; and lastly what should be the distance of the corrector from the objective? A. For your dialytic telescope, use a plano-convex lens 4¾ inches diameter, 28 in. focus for the object glass, of crown glass. A plano-concave lens 2½ inches diameter, 21 inches focus, dense flint glass. Place the flint lens at about 13 inches from the object glass, plane side toward the eye, and in a manner to allow of a small adjustment for final correction. The focus of the combination will be about 5 feet.

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Sash fastener, McCloskey & Coleman ... 282,005
Sash fastener, A. Montant ... 281,714
Saw frame, buck, W. Clemson ... 281,837
Saw guard, T. P. Heinemann ... 281,690
Sawmill head block, H. R. Barnhurst ... 281,780
Sawmill head block facing, A. F. Griswold ... 281,762
Scale, weighing, W. G. Collier ... 281,753
Scraper, ditch and road, J. W. Hedges *et al* ... 281,875
Scraper, sulky, P. Englehart ... 281,986
Screw, wood, I. F. Brown ... 281,831
Seal, car, F. G. Gillmore ... 281,863
Seal lock, W. H. Williams ... 282,019
Seed huller, cotton, P. McDermott ... 281,902
Separator. See Cotton separator.

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Service box, cast lead, E. W. Meyer..... 281,712
Sheet delivery apparatus, L. C. Crowell..... 281,754
Sheet metal vessel handles, attachment of, E. Mouhot..... 282,007
Sheller. See Corn sheller.
Shoe, Toll & Weber..... 281,739
Shoe fastener, F. J. Mix..... 281,909
Shutter worker, A. C. Wyckoff..... 281,748
Silk and thread polishing machine, W. R. Landfear..... 281,705
Slate frame, C. Nelson..... 281,785, 281,786
Slate frames, machine for forming muffling strips for, C. Nelson..... 281,787
Sliding gate, S. J. Miller..... 281,908
Snap, harness, L. Flagg..... 281,857
Snow plow, W. H. H. Baker..... 281,954
Soap, W. H. Townsend..... 281,807
Spark arrester, R. M. Howling..... 281,766
Speculum and dilator, N. S. Hubbell..... 281,880
Spring. See Vehicle spring.
Square, C. W. Green..... 281,761
Station indicator, A. B. Gill..... 281,684
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Steam boiler, vertical, J. A. Langdon..... 281,890
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Steam engine, J. Walrath..... 281,809
Steam generator, sectional, W. P. Thompson..... 281,946
Stereoscope, H. C. White..... 281,743
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Thill coupling, Wood & Taylor..... 282,021
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Tie. See Bag, bale, and bundle tie. Bale tie. Railway tie.
Tile machine, C. J. Merrill..... 281,711
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Toy, A. Vick..... 281,948
Toy velocipede, H. S. Lockwood..... 281,894
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Traction wheel, F. E. Young..... 282,022
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Tube stopper, D. J. Morgan..... 282,006
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Umbrella, Bollack & Mayer..... 281,827
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Valve, steam engine, G. H. Burley..... 281,665
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Vehicle propelled by electricity, E. Fox..... 281,859
Vehicle, side bar, F. G. Bippus..... 281,962
Vehicle spring, G. F. Putnam..... 281,728
Vehicle spring, Slifer & Bazzett..... 281,934
Vehicle, two-wheeled, Chandler & Williams, 281,971, 281,972
Vehicle, two-wheeled, L. Christy..... 281,670
Vehicle, two-wheeled, L. Green..... 281,994
Vehicle, two-wheeled, F. A. Maus..... 281,896
Vehicle, two-wheeled, C. M. Murch..... 281,783
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Washer. See Leather washer.
Washing machine, J. F. Hill..... 281,996
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Wheel. See Traction wheel. Wheelbarrow wheel.
Wheelbarrow wheel, L. H. Goodwin..... 281,865
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Mat, E. E. & O. H. Widdifield..... 14,133
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Oilcloth, floor, C. T. & V. E. Meyer..... 14,120 to 14,123
Piano case, square, A. Kaucher..... 14,118
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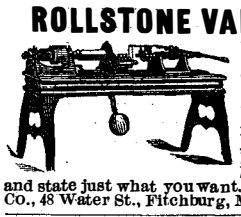

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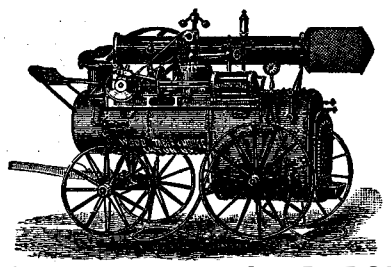

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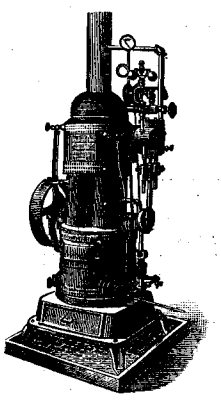

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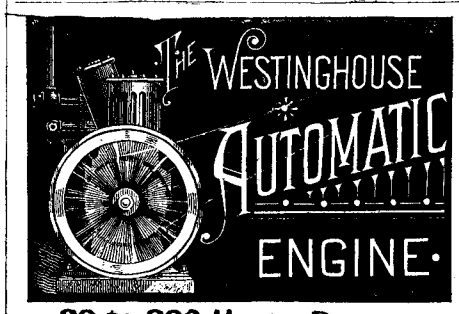

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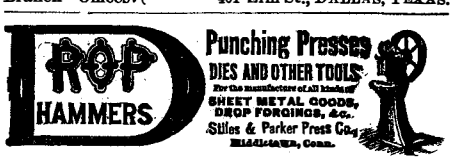

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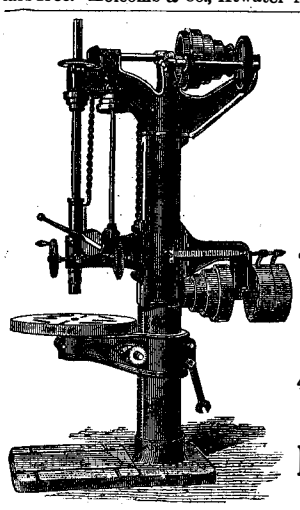
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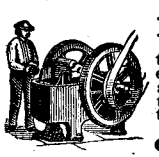
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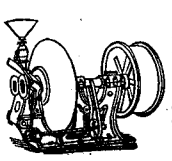
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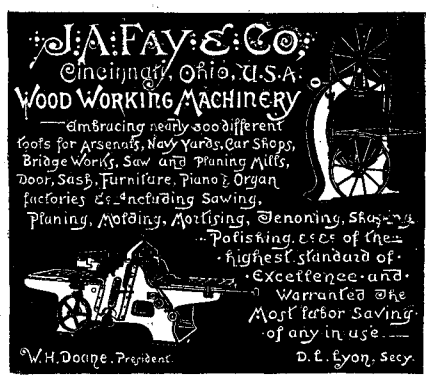
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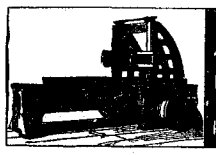
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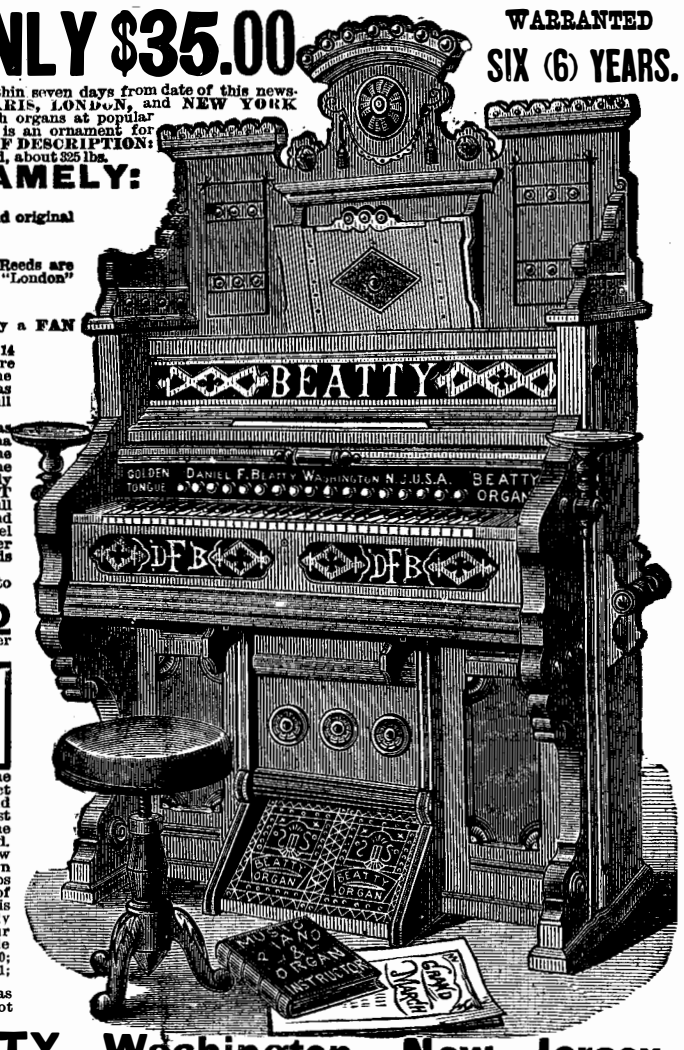

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Remember to secure this **GREAT BARGAIN,** you should order at once before the limited time has expired. Nothing can be gained by long correspondence. My sole object is to have this popular organ introduced, without a moment's delay, into every household throughout civilization, as early and as quickly as possible. I am willing to offer the first instrument at a sacrifice to introduce, as every one sold so far has sold others. In one particular instance thirty sales, at $65 each, have followed the first organ purchased. First Organ is shipped at **$35.00** as an advertisement. All I ask in return of you is to show the instrument to your circle of friends. The instrument speaks for itself, it sings its own praises. If you are unable to accept this Great Offer, write me your reason why. Perhaps you have an Instrument already of some other make and are not pleased. If so, dispose of it and order this. A friend of yours may desire an organ. Call their attention to this advertisement. If they are from home, mail this offer to them. If you can conveniently help me extend the sale of these Popular Instruments, I shall certainly appreciate your efforts. Shipments of Beatty's Organs, Church, Chapel, and Parlor (this does not include Beatty's Pianofortes) during the past seven months were as follows: December, 1882, 1,410; January, 1883, 1,102; February, 1883, 1,152; March, 1883, 1,435; April, 1883, 1,335; May, 1883, 1,401; **JUNE, 1883, 1,606. TOTAL, 9,441.**

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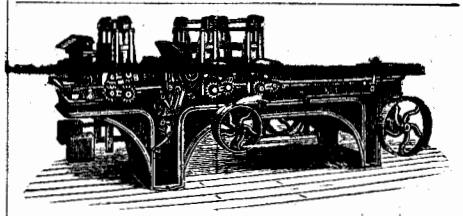

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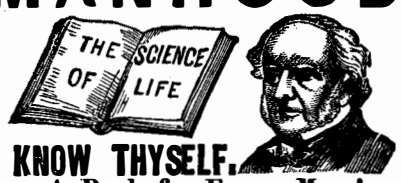

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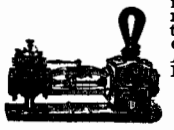

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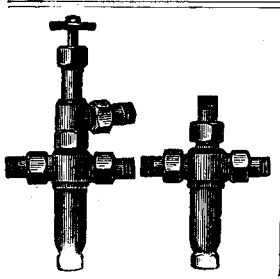

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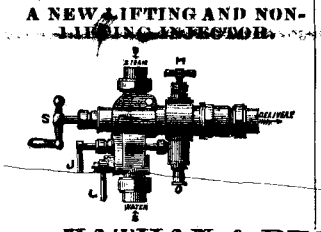

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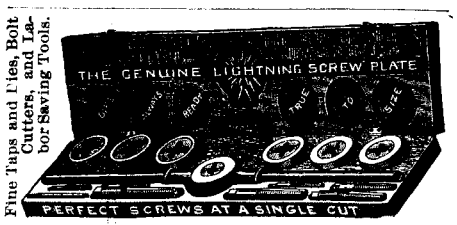

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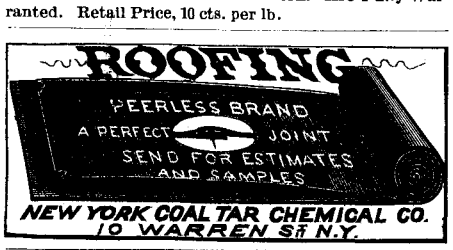

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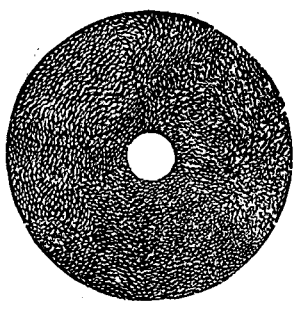

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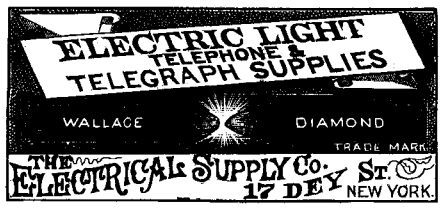

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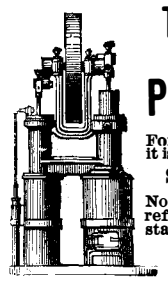

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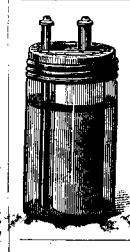

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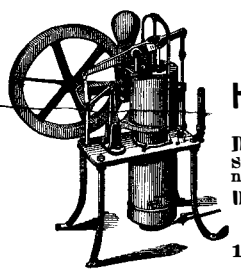

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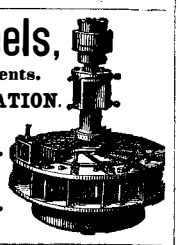

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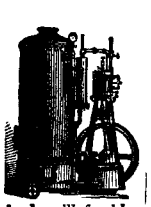

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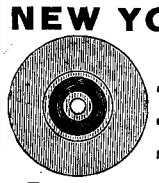

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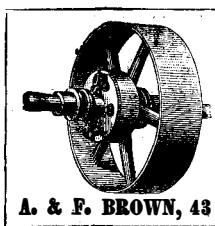

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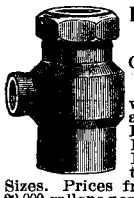

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